

Revision and morphological phylogenetic analysis of the funnel web spider genus *Agelenopsis* (Araneae: Agelenidae)

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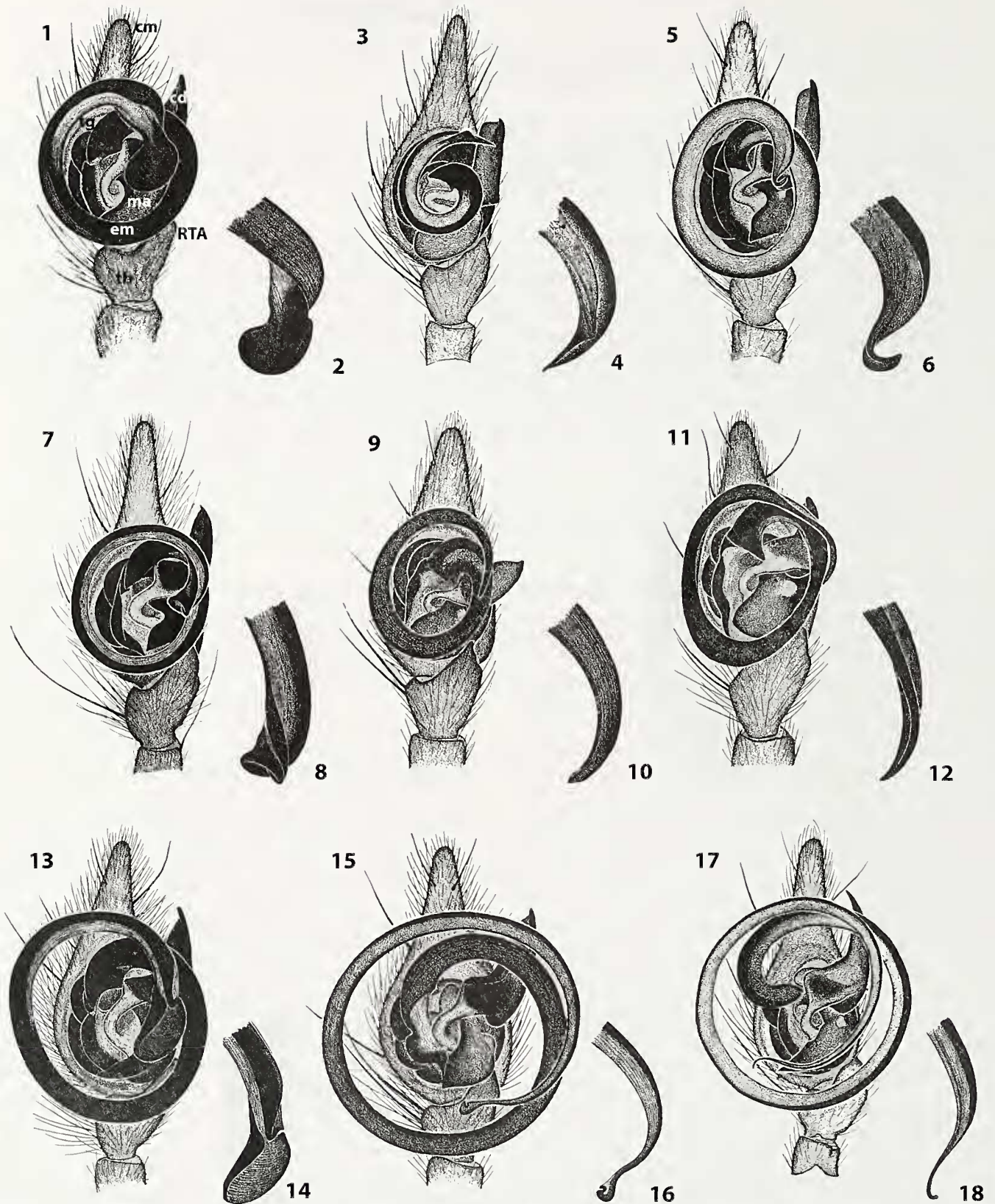
Abstract. The Nearctic agelenid spider genus *Agelenopsis* Giebel 1896 is revised, with redescriptions of the 13 known species including: *A. actuosa* (Gertsch & Ivie 1936), *A. aleenae* Chamberlin & Ivie 1935, *A. aperta* (Gertsch 1934), *A. emertoni* Chamberlin & Ivie 1935, *A. kastoni* Chamberlin & Ivie 1941, *A. longistyla* (Banks 1901), *A. naevia* (Walckenaer 1841), *A. oklahoma* (Gertsch 1936), *A. oregonensis* Chamberlin & Ivie 1935, *A. pennsylvanica* (C.L. Koch 1843), *A. potteri* (Blackwall 1846), *A. spatula* Chamberlin & Ivie 1935, and *A. utahana* (Chamberlin & Ivie 1933). We also include an identification key to the species and a species distribution map. Our cladistic analysis of *Agelenopsis* is based upon 31 genitalic and somatic characters using *Hololena hola* (Chamberlin 1928) as the outgroup taxon and including three species of *Barronopsis* Chamberlin & Ivie 1941 in the analysis since *Barronopsis* has been considered a sister taxon to *Agelenopsis* in previous work. The cladistic analysis found 22 most parsimonious trees unambiguously supporting *Agelenopsis* monophyly. The majority rule consensus provides support for a clade including (((*A. pennsylvanica* + *A. potteri*) + *A. actuosa*) + *A. emertoni*); another clade including (((*A. aleenae* + *A. spatula*) + *A. aperta*) + *A. kastoni*) + *A. naevia*; and a third clade including ((*A. oregonensis* + *A. utahana*) + *A. longistyla*). Our analysis supports species groups proposed by researchers using molecular characters.

Keywords: Cladistic analysis, taxonomy, phylogeny, *Barronopsis*, *Hololena*

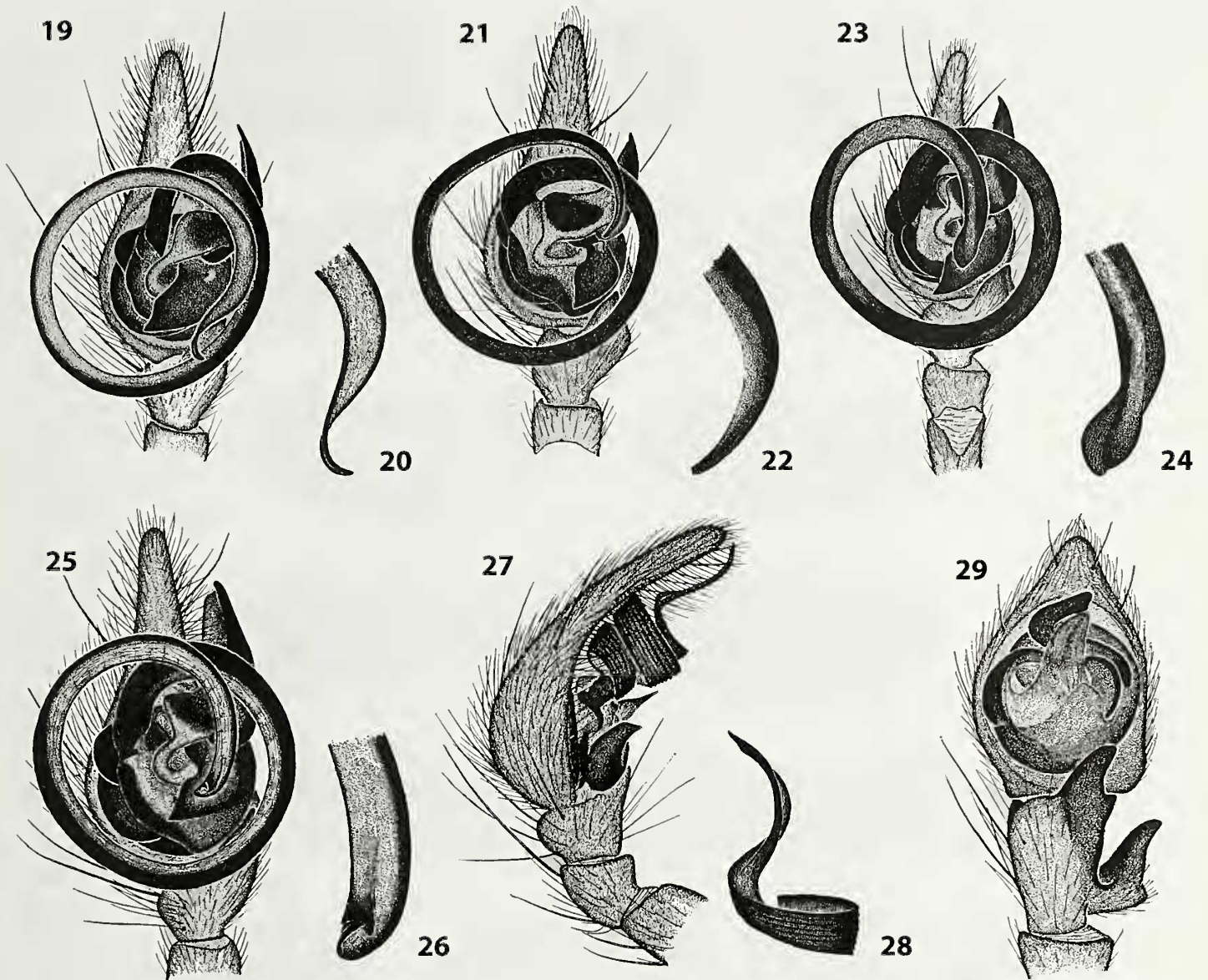
Since the formation of the family Agelenidae (Koch 1837), the relationships among and within genera have not been clearly defined and there is still need for much revision (Bennett & Ubick 2005). Agelenids are members of a family of funnel web spiders, including 300 species in North America, whose members all construct sheet webs with funnel retreats in various habitats, including grasses, among rocks or low bushes, and sometimes in protected places on buildings, wherever a substructure provides an adequate hiding area for the funnel portion of the web (Guarisco 2014 and pers. obs). The Nearctic genus *Agelenopsis* includes thirteen species that range in size from 6 to 18 mm: *Agelenopsis actuosa* (Gertsch & Ivie 1936), *A. aleenae* Chamberlin & Ivie 1935, *A. aperta* (Gertsch 1934), *A. emertoni* Chamberlin & Ivie 1935, *A. kastoni* Chamberlin & Ivie 1941, *A. longistyla* (Banks 1901), *A. naevia* (Walckenaer 1841), *A. oklahoma* (Gertsch 1936), *A. oregonensis* Chamberlin & Ivie 1935, *A. pennsylvanica* (C.L. Koch 1843), *A. potteri* (Blackwall 1846), *A. spatula* Chamberlin & Ivie 1935, and *A. utahana* (Chamberlin & Ivie 1933). While most agelenids have long posterior spinnerets, *Agelenopsis* is one of three genera in the family (*Agelenopsis*, *Calilena* Chamberlin & Ivie 1941 and *Melpomene* O. Pickard-Cambridge 1898) with the distal portion of the posterior spinnerets approximately twice the length of the basal segment (Bennett & Ubick 2005). All other genera have distal and basal segments approximately the same length. *Agelenopsis* males have a large, openly coiled embolus that lies flat across the face of the palp (Figs. 1–26). The female's epigynum is comprised of an open oval atrium with a coupling cavity that is clearly seen on the posterior edge of the atrium, separated by a sclerotized bridge (Figs. 30–42). Both the sweeping circular coil of the embolus and distinctive shape of the embolus tip in the male and presence of a coupling cavity in the female make *Agelenopsis* relatively straightforward to identify and distin-

guish from other agelenid genera. The taxonomic relationships among the species within the genus, however, are not so clearly defined. Nine of the 13 currently known species of *Agelenopsis* were originally placed within *Agelena*: *A. actuosa*, *A. aperta*, *A. longistyla*, *A. naevia*, *A. oklahoma*, *A. oregonensis*, *A. pennsylvanica*, *A. potteri*, and *A. utahana*. Through the first three decades of the twentieth century, collectors made various notes on and descriptions of spider species ultimately placed within the genus *Agelenopsis* (Petrunkevitch 1925; Gertsch 1934, 1936; Chamberlin & Ivie 1933, 1935; Gertsch & Ivie 1935, 1936; Exline 1938).

A revision of *Agelenopsis* and a few other genera in Agelenidae was published over seventy years ago (Chamberlin & Ivie 1941). Taxonomic contributions to this genus have since been made by a number of researchers (Seyler 1941; Chamberlin & Ivie 1944; Muma 1945; Gering 1953; Roth 1954, 1956; Roth & Braeme 1972; Roth & Brown 1986; Paison 1997; Ayoub et al. 2005; Stocks 2009; Galasso 2012). There have been a number of ecological and behavioral studies on *Agelenopsis*, predominantly on *A. aperta* (Riechert et al. 1973; Riechert 1974, 1976, 1978, 1981, 1982, 1985, 1986; Riechert & Tracy 1975; Gertsch & Riechert 1976; Riechert & Lockley 1984; Hammerstein & Riechert 1988; Riechert & Smith 1989; Riechert & Hedrick 1993; Singer & Riechert 1994; Riechert & Singer 1995; Galasso 2012; Guarisco 2014). Based on molecular phylogenetic work on the genus, *Agelenopsis* shares a sister relationship with *Barronopsis* (Ayoub et al. 2005; Stocks 2009). *Barronopsis*, originally a subgenus of *Agelenopsis* and elevated to its own genus by Lehtinen (1967), was included in our cladistic analysis. In the present paper we revise *Agelenopsis*, provide redescriptions of the 13 known species, provide detailed illustrations of male and female genitalic characters, include an identification key to the species and a species distribution map, and determine the monophyly



Figures 1-18.—Male palps in ventral view and detail of embolic tips for *Agelenopsis*. 1-2) *A. alceae*, 3-4) *A. pennsylvanica* (note the subtriangular segment evident in the embolic tip of 4), 5-6) *A. potteri*, 7-8) *A. actinosa*, 9-10) *A. utahana*, 11-12) *A. oregonensis*, 13-14) *A. spatula*, 15-16) *A. longistyla*, 17-18) *A. oklahoma*. Abbreviations: cd = conductor, cm = cymbium, em = embolus, ma = median apophysis, RTA = retrolateral tibial apophysis, tb = palpal tibia, tg = tegulum. Drawings from Chamberlin & Ivie 1941, by permission from Entomological Society of America.



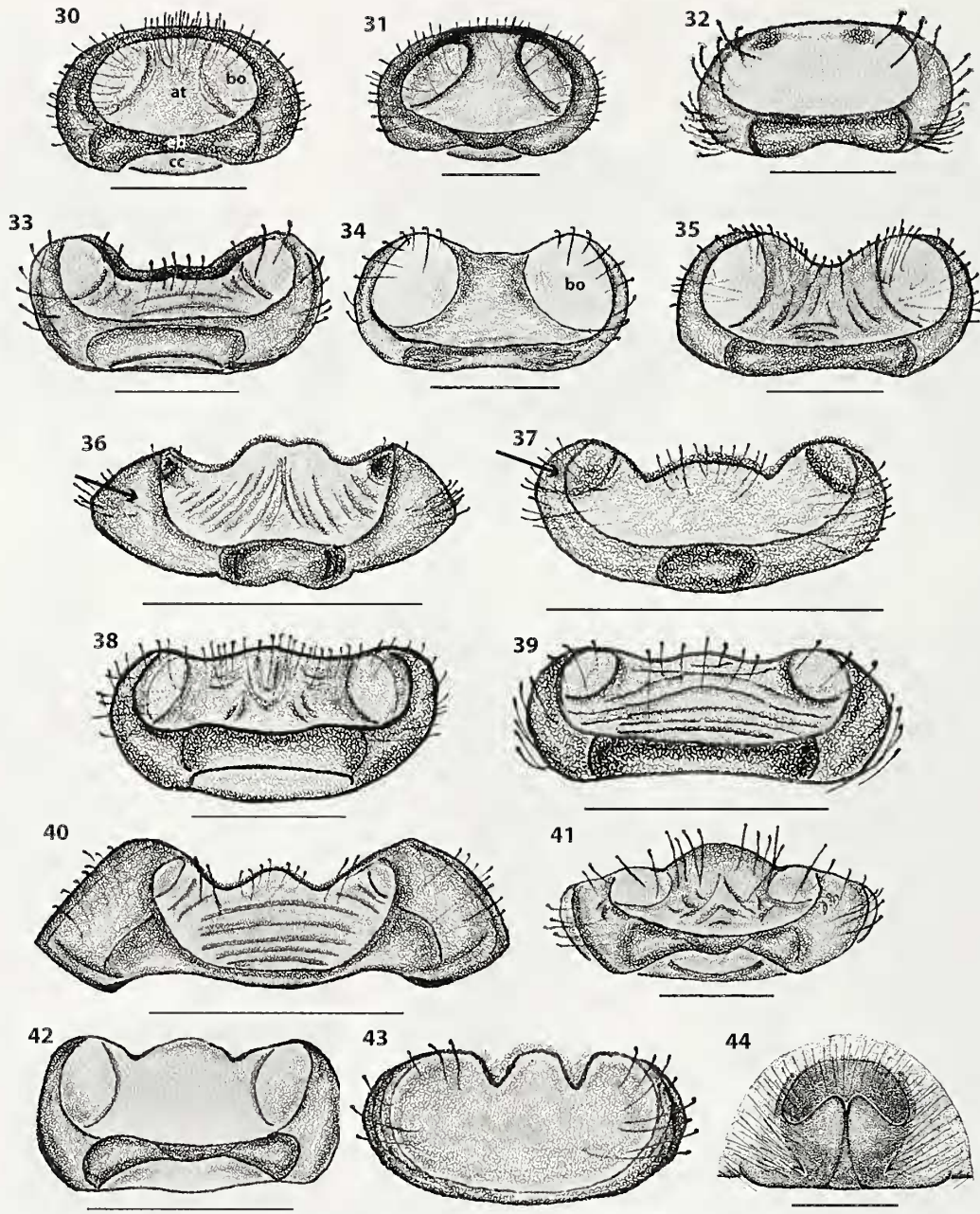
Figures 19–29.—Male palps in ventral view and detail of embolic tip for *Agelenopsis*, a representative *Barronopsis*, and the outgroup *Hololena hola*. 19–20) *A. kastoni*, 21–22) *A. naevia*, 23–24) *A. aperta*, 25–26) *A. emertoni*. 27–28) *B. floridensis*, 29) *H. hola* ventral pedipalp. All drawings from Chamberlin & Ivie (1941) except *H. hola* from Chamberlin & Gertsch (1928), by permission from Entomological Society of America.

of the genus as well as the relationships among the species within *Agelenopsis* using a morphological cladistic analysis.

METHODS

Material examined.—Specimens used were from the following institutions and private collections: American Museum of Natural History, New York (AMNH); New Mexico State University Arthropod Museum, Las Cruces (NMSU); Burke Museum of Natural History and Culture, University of Washington (BMNH); California Academy of Sciences, San Francisco (CAS); Denver Museum of Nature & Science, Denver Colorado (DMNS); Florida State Collection of Arthropods, Gainesville, (FSCA); Hank Guarisco Collection, Lawrence, Kansas (HJG); Midwestern State University, Department of Biology, Wichita Falls, TX (MWSU); Museum of Comparative Zoology, Harvard University, Cambridge, MA (MCZ); National Museum of Natural History, Smithso-

nian Institute, Washington D.C. (USNM); Texas A&M, College Station, TX (TXAM); and University of Colorado, Boulder (CU). Vial identification numbers are included if the loaning institution provided them. We examined and photographed specimens using an Olympus SZX12 microscope with a mounted Olympus UCMD3 camera and Spot Basic™ (4.1) software. We used the Helicon Focus stacking software and Adobe Photoshop CS5 for final images and ArcGIS version 10.0 to prepare distribution maps. Many of the labels for the older specimens used in this study only list degrees or degrees and minutes for the coordinates; some provide no locality data at all. Since so many of the specimens examined for this revision were poorly georeferenced, for the distribution map we supplemented these data with data from specimens borrowed from Ayoub and Riechert for their study (Ayoub & Riechert 2004) and from data from several collections accessed from the Symbiota Collections of



Figures 30–44.—Epigyna in ventral view of *Agelenopsis*, *Barronopsis*, and *Hololena*. 30) *A. pennsylvanica*, 31) *A. potteri*, 32) *A. actiosa*, 33) *A. naevia*, 34) *A. aleenae*, 35) *A. spatula*, 36) *A. utahana*, 37) *A. oregonensis*, 38) *A. oklahoma*, 39) *A. kastoni*, 40) *A. longistyla*, 41) *A. aperta*, 42) *A. emertoni*, 43) *B. floridensis*, 44) *H. hola*. Scale bars = 0.5 mm. Abbreviations: at = atrium, bo = opening to bursa, cc = coupling cavity, eb = epigynal bridge. Drawing of *H. hola* from Chamberlin & Gertsch (1928) by permission from Entomological Society of America.

Arthropods Network database (<http://symbiota4.acis.ufl.edu/scan/portal/>). Under Taxonomy, we recorded locality data as written on the label to accurately reflect those data as recorded, but have converted all data to decimal degrees where possible for consistency in presentation. Only those specimens for which good locality information was discernible were used for distribution maps unless they represent unique state records, in which case these were also included on the map.

Measurements.—We generated our own set of measurements based upon characteristics considered diagnostic by Chamberlin & Ivie (1941), Paison (1997), and Stocks (2009). All meristic and genitalic measurements were documented in millimeters (mm) using an Olympus SZX12 microscope and

Spot Basic™ (4.1) software. For both males and females, we determined the length of femur and tibia-patella for legs I and IV, cephalothorax length, cephalothorax width both at the narrowest point just behind the eyes and at the widest point, body length (excluding spinnerets), and length of basal and distal segments of the posterior lateral spinnerets. Both leg and spinneret measurements were taken from a lateral view on the left side of the specimen when possible (otherwise, from the right side). Cephalothorax and body length measurements were assessed from a dorsal perspective. Additionally, we took a number of epigynal measurements: atrial length (at widest and narrowest points) and width, epigynal length and width, epigynal bridge length and width (epigynal bridge labeled “eb”

Table 1.—Character matrix for the cladistic analysis of the spider genus *Agelenopsis*. See the text for a description of the 31 characters used. *Hololena hola* was used as the outgroup. Three species of *Barronopsis* were included because other studies have suggested *Barronopsis* is a sister taxon to *Agelenopsis*.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
<i>H. hola</i>	0	0	0	0	0	0	?	?	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>B. floridensis</i>	0	1	1	1	0	2	0	0	1	0	1	0	2	?	0	1	0	0	2	1	0	1	1	2	1	1	0	0	1	2	2
<i>B. jeffersi</i>	0	1	1	1	0	2	0	0	1	0	1	0	2	?	0	1	0	0	2	1	0	1	1	2	1	1	0	1	1	2	1
<i>B. texana</i>	0	1	1	1	0	2	0	0	1	0	1	0	2	?	0	1	0	0	2	1	0	1	1	2	1	1	0	0	1	2	1
<i>A. actuosa</i>	1	0	0	1	1	0	1	0	1	0	0	0	0	1	0	1	1	1	0	0	1	1	0	1	1	0	0	0	0	1	2
<i>A. aleenae</i>	1	0	0	0	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	0	1	1	0	1	0	0	0	0	2	1	0
<i>A. aperta</i>	1	0	0	1	1	1	1	1	1	0	0	1	2	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	2	1	0
<i>A. emertoni</i>	1	0	0	0	0	0	0	0	0	0	0	1	2	1	1	1	1	1	1	0	1	0	0	0	1	0	0	0	0	1	0
<i>A. kastoni</i>	1	0	0	0	1	1	1	2	1	0	1	1	2	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0
<i>A. longistyla</i>	1	0	0	0	0	1	1	0	1	0	0	0	2	1	0	1	1	1	1	0	1	1	0	0	0	0	0	1	1	2	1
<i>A. naevia</i>	1	0	0	0	1	2	1	1	0	0	0	1	1	0	1	1	1	1	1	0	1	1	0	0	0	0	0	0	1	0	1
<i>A. oklahoma</i>	1	0	0	0	0	0	1	0	1	0	0	1	2	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	1	2	1
<i>A. oregonensis</i>	1	0	0	0	0	1	0	0	2	0	1	0	2	0	1	1	1	1	1	0	1	1	0	1	0	0	0	0	1	1	1
<i>A. pennsylvanica</i>	1	0	0	1	1	0	1	0	1	0	0	1	0	1	1	1	1	1	1	0	1	0	0	1	1	0	0	1	0	2	2
<i>A. potteri</i>	1	0	0	1	1	0	1	0	1	0	0	1	0	0	1	1	1	1	1	0	1	0	0	1	0	0	1	0	1	0	2
<i>A. spatula</i>	1	0	0	0	0	1	0	1	1	0	0	0	1	1	1	1	1	1	1	0	1	1	0	1	1	0	0	0	2	0	0
<i>A. utahana</i>	1	0	0	0	0	2	1	2	2	1	1	0	2	0	0	1	1	1	0	0	1	0	0	1	0	0	0	0	1	0	1

in Fig. 30), width of opening of the bursa from its outer edge (as visible externally) to atrial edge (i.e. the width of the opening labeled “bo” in Figs. 30, 34), and coupling cavity length and width (coupling cavity is labeled “cc” in Fig. 30).

Cladistic analysis.—The cladistic analysis was based on the 13 ingroup taxa with *Hololena hola* (Chamberlin 1928) (from Chamberlin & Gertsch 1928) used as an outgroup (Figs. 29, 44, 60). Because other studies suggest that *Barronopsis* is a sister taxon to *Agelenopsis* (Ayoub et al. 2005; Stocks 2009) and because this genus was originally described as a subgenus of *Agelenopsis* (Giebel 1869), we included three species in this genus in our cladistic analysis: *Barronopsis floridensis* (Roth 1954), *B. jeffersi* (Muma 1945), and *B. texana* (Gertsch 1934). Our final character matrix included 31 morphological characters listed below as well as the ratios determined to be statistically significant based upon one-way ANOVA analyses. The final character matrix is presented in Table 1. The cladistic analysis was run using PAUPRat on the CIPRES Science Gateway (Nixon 1999; Sikes & Lewis 2001; Miller et al. 2010). Our optimality criterion was parsimony with heuristic search criteria, all characters were weighted equally, and we used tree bisection reconnection (TBR) branch swapping with random addition. We recorded the following ratios: cephalothorax width at widest point/cephalothorax length, cephalothorax length/body length (excluding spinnerets), and atrial width/atrial length, but ultimately eliminated the first two from the matrix because they were parsimony uninformative. The atrial width/atrial length character was statistically significant based upon a one-way ANOVA analysis ($F_{crit} = 1.78$, $df = 12$, $P < 0.001$). For this character, we determined character states using mean \pm variance to find natural groupings. For example, we found the species to fall into groups in which the mean + var was < 0.38 ; between 0.38 – 0.46 ; or > 0.46 .

RESULTS

Morphological characters.—The morphological characters used in the cladistic analysis included 31 characters as described below.

Female Characters:

1. Coupling cavity: [0] absent (e.g., Figs. 43, 44), [1] present (e.g., Fig. 30)
2. Bursa torsion: [0] loosely or not twisted distally (e.g., Figs. 45, 60), [1] tightly twisted distally (e.g., Fig. 59)
3. Number of turns of fertilization ducts visible at base of bursa: [0] ≤ 2 turns (e.g., Fig. 47), [1] 3 turns (e.g., Fig. 59)
4. Distance between bursae at base: [0] $\geq 1.5 \times$ diameter of bursa (e.g., Figs. 49, 60), [1] $< 1.5 \times$ diameter of bursa (e.g., Figs. 45, 59)
5. Spermathecae: [0] not touching (e.g., Figs. 52, 55), [1] touching (e.g., Figs. 49, 56)
6. Orientation of spermathecae in relation to bursae: [0] dorsal of bursae (e.g., Figs. 47, 53), [1] centered between bursae (e.g., Figs. 54, 55), [2] ventral of bursae (e.g., Figs. 48, 51)
7. Orientation of connecting tube as it enters spermatheca: [0] lateral (e.g., Fig. 50), [1] ventral (e.g., Fig. 49)
8. Connecting tube pattern as it enters spermatheca: [0] straight entry (e.g., Fig. 53), [1] tubes diverge and converge again (e.g., Figs. 49, 50), [2] complex looping (e.g., Fig. 54)
9. Shape of spermatheca: [0] spherical (e.g., Figs. 48, 58), [1] oblong (e.g., Figs. 47, 49), [2] tube-like (e.g., Figs. 51, 52)
10. Orientation of spermatheca: [0] longitudinal (e.g., Figs. 49, 50), [1] transverse (Fig. 51)
11. Shape of diverticle: [0] curved and tubular (e.g., Fig. 57), [1] bulbous (e.g., Figs. 51, 52)
12. Distance between diverticles: [0] $> \frac{1}{2}$ diameter of diverticle (e.g., Fig. 50), [1] $< \frac{1}{2}$ diameter of diverticle (e.g., Fig. 57)
13. Anterior atrial edge: [0] smooth (e.g., Figs. 30, 32), [1] monolobed (e.g., Figs. 33, 34), [2] strongly or moderately bilobed (e.g., Figs. 37, 38)
14. If epigynal bridge present: [0] \leq half the diameter of atrium (e.g., Figs. 31, 33), [1] $>$ than half the diameter of atrium (e.g., Figs. 30, 40)

15. Copulatory duct opening of atrium: [0] partially or not visible (e.g., Figs. 36, 40), [1] mostly visible (e.g., Figs. 34, 37)

Male characters:

16. Complexity of RTA: [0] complex (Fig. 29), [1] simple (e.g., Figs. 1, 3)
 17. Shape of RTA: [0] truncate (e.g., Figs. 9, 29), [1] pointed (e.g., Figs. 1, 23)
 18. Orientation of median apophysis (directed): [0] up, parallel with cymbium tip (e.g., Figs. 27, 28), [1] down, at a 45° angle from cymbium base (e.g., Figs. 1, 5)
 19. Shape of median apophysis: [0] thick, more rounded tip (e.g., Figs. 7, 9), [1] thick, somewhat pointed (e.g., Figs. 1, 23), [2] sharp, thorn-like spur (e.g., Fig. 27)
 20. Appearance of tegulum: [0] remains an integral part of embolic structure with either no or slightly rounded apophysis (e.g., Figs. 15, 29), [1] projects from embolic structure ending in a pointed apophysis (e.g., Fig. 27)
 21. Conductor size: [0] small and short (e.g., Figs. 27, 29), [1] large and long (e.g., Figs. 1, 3)
 22. Conductor shape: [0] truncate (e.g., Figs. 3, 25), [1] pointed (e.g., Figs. 1, 7)
 23. Surface texture of embolus: [0] lamellate throughout (e.g., Figs. 13, 15), [1] smooth proximally, lamellate distally (e.g., Fig. 27)
 24. Coiling of embolus: [0] loose throughout (e.g., Figs. 23, 25), [1] slightly tight throughout (e.g., Figs. 1, 7), [2] very tight basally and loose distally (e.g., Fig. 27)
 25. Embolic subtriangular segment: [0] absent (e.g., Figs. 2, 24), [1] present (e.g., Figs. 4, 26)

26. Embolus orientation in relation to plane of the cymbium: [0] parallel (e.g., Figs. 3, 11), [1] oblique (e.g., Fig. 27)
 27. Embolic tip direction: [0] not recurved (e.g., Figs. 16, 26), [1] recurved (e.g., Figs. 18, 20)
 28. Embolic tip detail: [0] without notch (e.g., Figs. 2, 4), [1] with notch (e.g., Fig. 16)
 29. Embolic tip shape: [0] remains thick throughout (e.g., Figs. 8, 26), [1] tapers distally (e.g., Figs. 16, 20), [2] thickens distally (spatulate) (Figs. 2, 14, 24)
 30. Embolic tip termination angle: [0] $\leq 470^\circ$ (e.g., Figs. 4, 22), [1] 540° (e.g., Figs. 2, 8), [2] $\geq 720^\circ$ (e.g., Figs. 16, 18)

Meristic character:

31. Atrium length/atrium width (the ratio reflects shape of atrium, be it more oblong or openly rounded): [0] > 0.38 and < 0.46 (e.g., Figs. 34, 41), [1] < 0.38 (e.g., Figs. 33, 40), [2] > 0.46 (e.g., Figs. 30, 31)

Cladistic analysis.—Twenty-nine of the characters were parsimony informative. The heuristic search resulted in 22 best fit trees retained in memory each with tree length = 87, consistency index (CI) = 0.46, homoplasy index (HI) = 0.54, retention index (RI) = 0.63, and rescaled consistency index (RC) = 0.29. The 50% majority rule consensus tree (Fig. 62) supported the monophyly of *Agelenopsis*. It also provided support for a clade including (*(A. pennsylvanica + A. potteri + A. actiosa) + A. emertoni*); another clade including (*(A. aleenae + A. spatula) + A. aperta + A. kastoni + A. naevia*); and a third clade including (*(A. oregonensis + A. utahana) + A. longistyla*). *Agelenopsis oklahoma* was on a separate clade more distantly related to the clade including *A. longistyla*, *A. oregonensis*, and *A. utahana* than to the other species.

KEY TO SPECIES OF *AGELENOPSIS*

1(a) Males	2
1(b) Females	14
2(a) Diameter of coiled embolus not substantially wider than width of cymbium (Figs. 1, 3)	3
2(b) Diameter of coiled embolus noticeably wider than width of cymbium (Figs. 13, 15, 17)	8
3(a) Embolic tip spatulate (Fig. 2)	<i>aleenae</i>
3(b) Embolic tip pointed (Fig. 4)	4
4(a) Embolus coil makes full circle with tip position perpendicular to cymbium (Fig. 3)	<i>pennsylvanica</i>
4(b) Embolus coil makes more than a full circle (Figs. 5, 7)	5
5(a) Embolic tip recurved (Fig. 6)	<i>potteri</i>
5(b) Embolic tip procurved or generally straight (Figs. 8, 10)	6
6(a) Embolic tip generally straight and twisted at tip (Fig. 8)	<i>actiosa</i>
6(b) Embolic tip procurved and tapered (Figs. 10, 12)	7
7(a) Conductor truncated (Fig. 9)	<i>utahana</i>
7(b) Conductor pointed (Fig. 11, pointed tip seen behind embolus)	<i>oregonensis</i>
8(a) Embolic tip spatulate (Fig. 14)	<i>spatula</i>
8(b) Embolic tip other than spatulate (Figs. 16, 18)	9
9(a) Embolic tip hooked (Fig. 16)	<i>longistyla</i>
9(b) Embolic tip other than hooked (Figs. 18, 20, 22)	10
10(a) Embolus coils make 2 full circles (Fig. 17)	<i>oklahoma</i>
10(b) Embolus coils make less than 2 full circles (Fig. 19, 21)	11
11(a) Embolic tip recurved (Fig. 20)	<i>kastoni</i>
11(b) Embolic tip procurved (Figs. 22, 24, 26)	12
12(a) Embolic tip procurved and tapering (Fig. 22)	<i>naevia</i>
12(b) Embolic tip procurved and twisted (Figs. 24, 26)	13
13(a) Conductor tip pointed (Fig. 23)	<i>aperta</i>
13(b) Conductor tip claw-like (Fig. 25)	<i>emertoni</i>
14(a) Atrial opening generally rounded; width less than twice its length (Figs. 30, 31)	15

14(b) Atrial opening more distinctly oval than rounded; width at least twice the length (Figs. 32, 33, 35)	16
15(a) Epigynal bridge almost as wide as atrial opening (Fig. 30)	<i>pennsylvanica</i>
15(b) Epigynal bridge much shorter than atrial opening (Fig. 31)	<i>potteri</i>
16(a) Anterior edge of atrial opening generally forms a smooth arc; epigynal bridge pinched in the middle, thick and wide, copulatory duct openings not visible (Fig. 32); internally, tip of bursa strongly procurved (Fig. 47)	<i>actuosa</i>
16(b) Anterior edge of atrial opening does not form a smooth arc (Figs. 33, 34)	17
17(a) Anterior edge of atrial opening is convex at center (Figs. 33, 34, 35)	18
17(b) Anterior edge of atrial opening is concave at center (Figs. 36, 37, 38)	20
18(a) Squared off, single inverted lobe at center of anterior edge of atrial opening; epigynal bridge short and thick (Fig. 33); spermatheca sits well back ventrally (Fig. 48)	<i>naevia</i>
18(b) Rounded, single inverted lobe at center of anterior edge of atrial opening (Figs. 34, 35); epigynal bridge thin and wide (Figs. 34, 35)	19
19(a) Bursa openings rounded, closely set, and very visible (Fig. 34); conducting tube emerges from top of bursa to descend to spermatheca (Fig. 49, ct)	<i>aleenae</i>
19(b) Bursa openings widely set and only partially visible (Fig. 35); thickened diverticle visible behind widely set bursae (Fig. 50, dt)	<i>spatula</i>
20(a) Epigynal bridge short and thick (Figs. 36, 37)	21
20(b) Epigynal bridge not short and thick (Figs. 38, 39)	22
21(a) Sclerotized edges of epigynum broaden anteriorly (Fig. 36, arrow)	<i>utahana</i>
21(b) Sclerotized edges of epigynum taper anteriorly (Fig. 37, arrow)	<i>oregonensis</i>
22(a) Atrial opening about 4 times as wide as long, almost capsule-like (Figs. 38, 39)	23
22(b) Atrial opening less than 4 times as wide as long (Figs. 40, 41)	24
23(a) Copulatory tube extends from top of bursa to spermatheca (Fig. 53, ct)	<i>oklahoma</i>
23(b) Copulatory tube extends from bottom of bursa to spermatheca (Fig. 54, ct)	<i>kastoni</i>
24(a) Width of sclerotized lateral edge of epigynum half the width of entire atrium (Fig. 40); very wide-set bursae basally (Fig. 55)	<i>longistyla</i>
24(b) Width of sclerotized lateral edge of epigynum less than half the width of entire atrium (Figs. 41, 42)	25
25(a) Diameter of atrium wider in center than on sides; sclerotized edges of epigynum broaden rather than taper anteriorly; epigynal bridge extends under cuticle creating distinct demarcation (Fig. 41)	<i>aperta</i>
25(b) Diameter of atrium is about as wide in center as on sides; sclerotized edges of epigynum taper rather than broaden anteriorly; epigynal bridge does not extend under cuticle (Fig. 42)	<i>emertoni</i>

TAXONOMY

Family Agelenidae C.L. Koch 1837

Genus *Agelenopsis* Giebel 1869

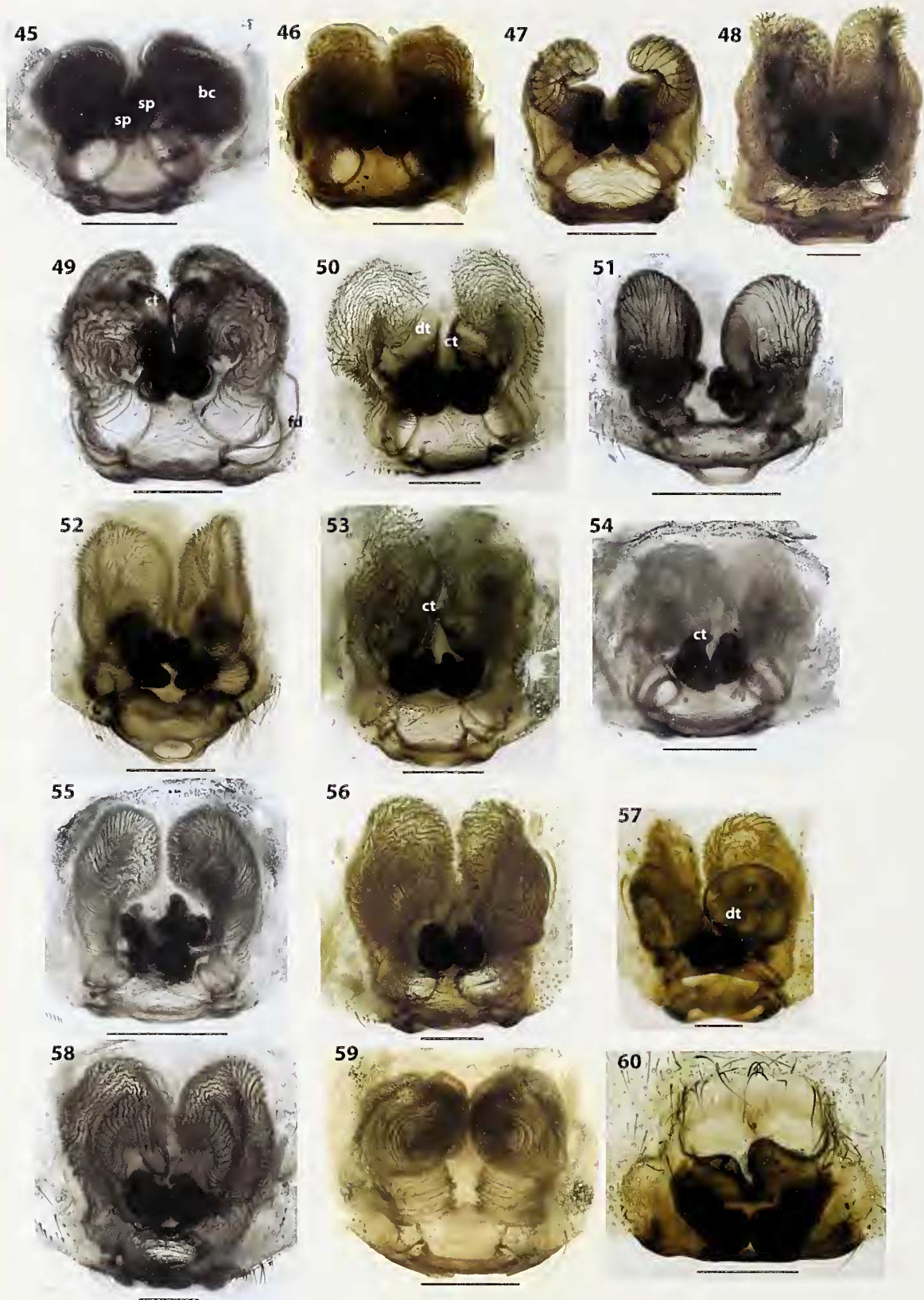
Type Species.—*Agelena potteri* Blackwall 1846: 43.

Diagnosis.—*Agelenopsis* is distinguished from other agelelid genera by the following combination of characteristics: 1) conspicuously long PLS with distal segment usually twice the length of basal; 2) looping, circular embolus, lamellate throughout (Figs. 1–25); 3) distinctly large and long conductor but reduced tegular apophysis and tegulum (Figs. 1–25); 4) presence of coupling cavity on posterior edge of epigynum resulting in an epigynal bridge on the posterior edge of the atrium (Figs. 30–42); 5) two distinct loopings of the fertilization duct around the base of the bursa (Figs. 45–58); 6) plicated bursa generally inflated and erect throughout (Figs. 45–58).

Agelenopsis can be distinguished from *Barronopsis* by the presence of a coupling cavity in *Agelenopsis* (compare Figs. 42, 43). Furthermore, the median apophysis (ma) in *Barronopsis* tapers to a thin, elongated point (Fig. 27) whereas the ma in *Agelenopsis* is blunter at the tip. The conductors of both genera also vary. That of *Agelenopsis* is large and is either pointed or truncate at its distal end while that of *Barronopsis* is small in comparison and is uniformly pointed. *Agelenopsis* and *Barronopsis* are unique in Agelenidae for having large, coiling emboli. The males of the remaining genera have short, curving compact emboli, with the exception of *Tortolena* whose

embolic structure, while compact, forms a figure-8 (Bennett & Ubick 2005). The primary difference between the emboli of *Agelenopsis* and *Barronopsis* lies in the coiling and tip structure. The *Barronopsis* embolus is oriented obliquely to the plane of the cymbium, is smooth proximally, lamellate distally with multiple, tight coils basally that loosen distally (Figs. 27, 28). Its tip tapers distally and is consistently notched. In *Agelenopsis*, the embolus is lamellate throughout and has one to one and a half slightly tight or loose coils that run parallel to the plane of the cymbium. Its tip may be notched or not, may taper distally or not, but usually has distinctive tips that make it easy to identify to species (Figs. 1–26).

Description of the genus.—General morphological characteristics as for the family. Body length varies throughout genus, ranging from 4–20 mm. Carapace uniformly longer than wide, squared-off at anterior end, broadening and rounded through thoracic region. Cephalothorax coloration ranges from reddish-yellow to reddish-brown with two thin brown bands widening as they extend posteriorly. Fovea is longitudinally oriented. A fine layer of plumose hairs covers the cephalothorax, abdomen, and legs. Eight small eyes are arranged in two strongly procurved rows. Clypeus is approximately two times diameter of AME. Endites, reddish-brown with lighter edges, are somewhat convergent at anterior edge and about two times the length of labium which is generally as long as wide. Sternum is reddish-brown in color and slightly longer than wide. Chelicerae are long and robust



Figures 45–60.—Dorsal view of dissected female genitalia for *Agelenopsis* and *Barronopsis* and ventral view of *A. aperta* and *H. hola* epigyna. 45) *A. pennsylvanica*, 46) *A. potteri*, 47) *A. actiosa*, 48) *A. naevia*, 49) *A. alceae*, 50) *A. spatula*, 51) *A. utahana*, 52) *A. oregonensis*, 53) *A. oklahoma*, 54) *A. kastoni*, 55) *A. longistyla*, 56) *A. aperta*, 57) ventral view of dissected genitalia of *A. aperta* showing the diverticle (dt), 58) *A. emertoni*, 59) *B. floridensis*, 60) ventral view of *H. hola* showing bursae lying below the atrium. Scale bars = 0.5 mm. Abbreviations: bc = bursa copulatrix, ct = conducting tube, dt = diverticle, fd = fertilization duct, sp = spermatheca.

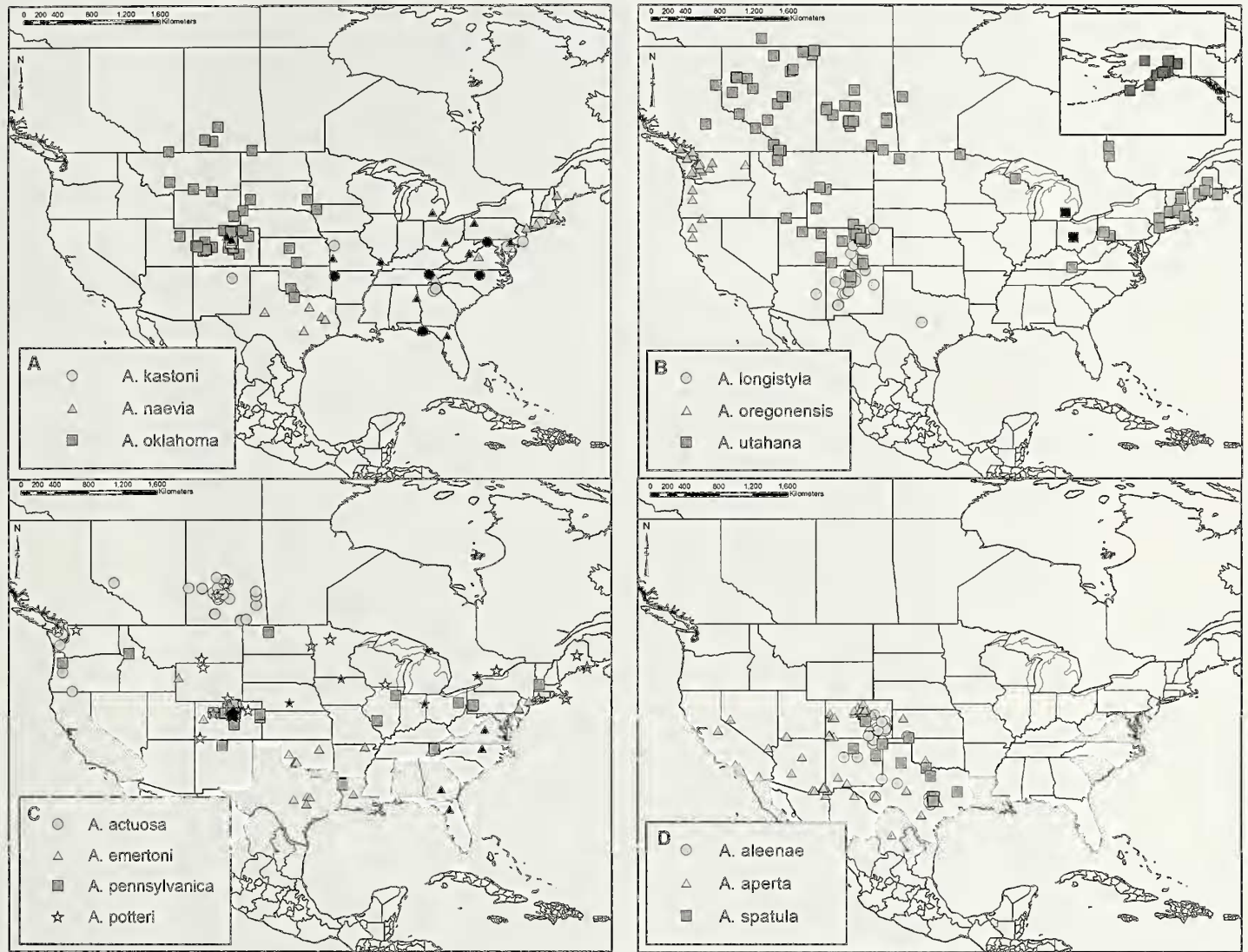


Figure 61.—Distribution map of *Agelenopsis* species. A) Distribution of *A. kastoni*, *A. naevia*, and *A. oklahoma*; B) Distribution of *A. longistyla*, *A. oregonensis*, and *A. utahana*; C) Distribution of *A. actuosa*, *A. emertoni*, *A. pennsylvanica*, and *A. potteri*; D) Distribution of *A. aleenae*, *A. aperta*, and *A. spatula*. Solid black symbols on the maps represent records of those species for states for which we have only state or county records and no other locale information, e.g., there is one record of *A. kastoni* in Anderson County, Tennessee.

and a deep brownish-red color. Each chelicera has a boss, 2–4 retromarginal teeth, and 3–4 promarginal teeth. Coloration of abdomen is highly variable from gray to brown, broken with two lighter, longitudinal bands of solid stripes or chevrons, regardless of size. Freckling is sometimes present dorso-posteriorly. Female abdomen is larger and more rounded than that of male which is more oblong in shape. Leg coloration is highly variable, but always banded. Legs are generally robust, with I and IV being longer than II and III. Leg pattern by length: IV, I, II, III. Setae and microsetae appear in pairs or sets of three on the femur, patella, tibia, metatarsus, and tarsus, becoming increasingly shorter and more profuse moving distally. Trichobothria on tarsi are of varying length. Spinnerets are uniformly yellowish-brown with the distal segment of the spinneret being almost always longer than the basal. Anterior spinnerets are truncated while posterior spinnerets are long and tapering towards the distal end.

The epigynal atrium of females is uniformly transversely rounded and undivided with a sclerotized rim (Figs. 30–42). In *Agelenopsis*, variation in shape of anterior edge of atrium helps distinguish one species from another and distinguishes it from the closely related *Barronopsis* in which the anterior sclerotized margin has tooth-like invaginations into the atrium (compare Figs. 30–42 with Fig. 43). Openings to the bursa (bo in Fig. 30) within the margins of the atrium are either easily discernible or indistinct. Copulatory ducts and bursae are not visible externally, but a shadowing of the spermathecae is sometimes noticeable on the ventral surface above the epigynum (although not in all specimens). Internally, fertilization ducts spiral around the base of the bursae, winding up to spermathecae (Figs. 45–58). The internal structure of the female genitalia is distinct from the bursa and copulatory ducts in *Barronopsis* (compare Figs. 45–58 to Fig. 59). The bursae of *Agelenopsis* are generally more inflated and loose than those of *Barronopsis* which are characteristically tightly

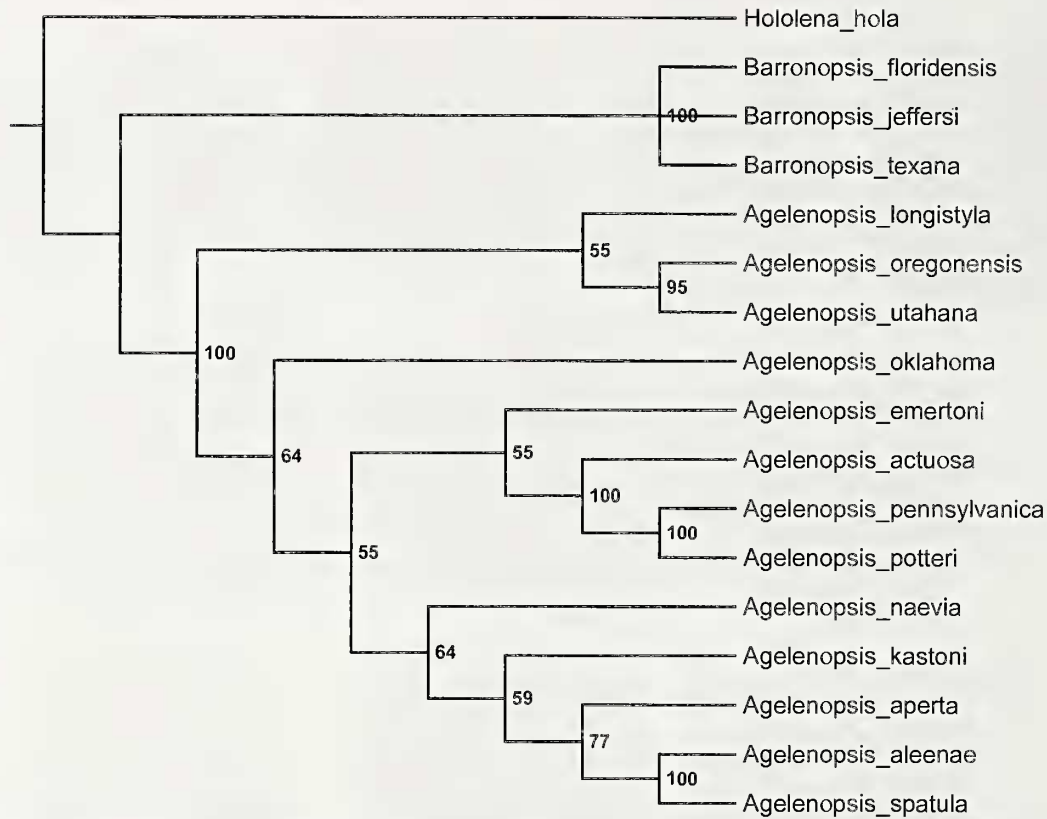


Figure 62.—50% majority rule consensus tree of the 22 minimal length trees of 87 steps found by PAUPRat when analyzing the character matrix presented in Table 1 (Length = 87, Consistency Index = 0.46, Homoplasy Index = 0.54, Retention Index = 0.63, Rescaled Consistency Index = 0.29). Numbers above clades are the bootstrap support values > 50% for those clades.

twisted (Fig. 59). The fertilization ducts wind three times around the base of the bursa in *Barronopsis* and only two times in *Agelenopsis*. Coupling cavity is wider than long and sits at a 90° angle below the atrium (Fig. 30, labeled “cc”).

Habitat.—All thirteen species of *Agelenopsis* prove to be opportunistic both in habitat choice and web design. While these spiders tend to build their webs in both short and tall grass prairie in rural areas, they will construct webs in whatever setting, be it natural or manmade, that affords them the most protection, although Guarisco (2014) suggests that sympatric species are segregated by habitat. In our observations on collection trips in northeastern New Mexico and southeastern Colorado where we collected primarily *A. aleenae*, web design did not vary much by location or habitat and was only limited in size by the amount of space available to build a web. A typical web took the form of a single, horizontal sheet, conforming in shape to its surrounding support structure, and reinforced with multiple strands of silk above the sheet (Fig. 63). Each web had one, and often multiple funnels, some of which remained distinctly separate while others converged below the sheet construction (pers. obs.). An earlier study examined the correlation between web size and hunger (Riechert 1981, 1982), but we noted web size to be predominantly dependent on the size of the web’s support structure. In our observations, most of the time, webs were built close to the ground, usually at approximately 10 cm. The only exceptions were those built high off the ground in very sturdy structures with impassable, protective retreat areas

like grooved tree limbs or open pipes where the spiders were secure from disturbance from cattle, wind, predators, and water (either in the form of rain or flooding), or those built at ground level, either within lava beds or leaf litter. In a study on web-site selection, Riechert & Tracy (1975) and Riechert (1976) rated leaf litter as a very important factor in web placement, even higher than prey availability, because such a substrate provides the funnels and burrows with a constant temperature. The areas where we collected the most spiders had the highest densities of vegetative litter.

Agelenopsis actuosa (Gertsch & Ivie 1936)
Agelena actuosa Gertsch & Ivie 1936: 22, f. 46–47.
 Figs. 7, 8, 32, 47, 61C

Type specimens.—Male holotype examined: *Oregon*, Tillamook County, Cape Meares, 22 August 1931, R.W. Macy, AMNH. Paratypes examined: Male paratype from *Oregon*, Benton County, Corvallis, 16 August 1934, J. Schuh, AMNH. Two male paratypes from St. Thomas, Ontario, Fall, 1929, L.E. James, AMNH.

Etymology.—None provided but “*actuosa*,” in Latin means “full of activity,” an appropriate descriptive adjective for any fast-moving agelenid.

Diagnosis.—The *A. actuosa* male is distinguished from other species in the genus by its generally straight-edged embolic tip (Figs. 7, 8), the distal edge of which twists over on itself from one edge to the other (Fig. 8). The *A. actuosa* female is



Figure 63.—*Agelenopsis* spiders and diversity of web architecture. A) Juvenile *Agelenopsis* in its funnel; B) *Agelenopsis aperta* male showing the long spinnerets; C) Web with funnel in branches of a cholla cactus; D) Web with funnel in the soil and the sheet web expanded on the surface; E) Lateral view of web showing expanse of the sheet up in the grass; F) Funnel built in a soil bank. Photos A, B, and F by Buzz Morrison, used with permission. Photos C, D, and E by JWZ.

distinctive in its uniquely shaped bursae, each curving sharply laterally toward the other (Fig. 47).

Description.—General description as for the genus. Male ($n = 32$): overall length 6.78–11.30 mm; carapace width at its widest point 2.14–4.01 mm; carapace width at its narrowest point 1.40–1.78 mm. Shape of retrolateral tibial apophysis (RTA) is nipple-like; shape of median apophysis is thick and somewhat rounded; conductor size is large with generally pointed shape; coiling of embolus is tight with an embolic tip termination angle of 540° ; embolus subtriangular segment is present; embolic tip orientation is not recurved; embolic tip is twisted; anelli on subtegulum are present (Figs. 7, 8). Female ($n = 34$): overall length 9.50–14.90 mm; carapace width at its widest point 2.69–4.23 mm; carapace width at its narrowest point 1.55–2.39 mm. Bursa is generally longer than wide, leaning ventrally when viewed from above anterior edge, and widely spaced from other bursa at the tip, but not basally;

orientation of each bursa tip is strongly procurved, tipped towards the other; fertilization duct winds twice around base of bursa; spermathecae are touching or nearly touching; ventral orientation of connecting tube as it enters spermatheca with a straight entry pattern; spermatheca is tear drop-shaped with a longitudinal orientation and lies dorsally of bursa; diverticle is a curved, thickened tube, much larger than spermatheca, widely set from the other; anterior atrial edge is smooth; epigynal bridge is thin and wide; bursa opening is partially visible when viewed straight on (Figs. 32, 47).

Distribution.—CANADA: *Alberta, British Columbia, Saskatchewan*; USA: *Oregon, Washington* (Fig. 61C).

Material examined.—CANADA: *Alberta, Little Smokey River, 10 km S. of Guy, 4 August 1965, 3♀, 2♂, J. Ivie & W. Ivie, AMNH. British Columbia, Wellington, Vancouver Island, 49°N, 123°W, 5 September 1949, 1♀, R. Guppy, AMNH. British Columbia, Wellington, Vancouver Island,*

49°N, 123°W, 20 September 1949, 1 ♀, R. Guppy, AMNH. *British Columbia*, Wellington, Vancouver Island, 49°N, 123°W, 20–24 August 1950, 1 ♀, R. Guppy, AMNH. *British Columbia*, Wellington, Vancouver Island, 49°N, 123°W, September 1950 (no day listed), 2 ♀, R. Guppy, AMNH. *British Columbia*, East side Saanich Inlet, 48°N, 123°W, collection date is probably 14 September 1935, 4 ♀, no collector listed, AMNH. *British Columbia*, East side Saanich Inlet, 48°N, 123°W, 14 September 1935, 4 ♀, no collector listed, AMNH. *British Columbia*, East side Saanich Inlet, 48°N, 123°W, 14 September 1935, 4 ♀, R. Chamberlin & W. Ivie, AMNH. *British Columbia*, West side Saanich Inlet and Sidney, Vancouver Island, 48°N, 123°W, 16 September 1935, 5 ♀, R. Chamberlin & W. Ivie, AMNH. *British Columbia*, Vancouver Island, Department of National Defense Rocky Point, 48.32°N, 123.55°W, 4 October 1995, malaise trap, garry oak, open meadow, 1 ♂, N. Winchester, DMNS ZA.31407. *Saskatchewan*, Anglin Lake, 53.73°N, 105.93°W, 29 July–19 August 1998, grassy hillside, pitfall traps, 3 ♂, D.J. Buckle, DMNS ZA.31366. *Saskatchewan*, Borden Bridge, 52.37°N, 107.15°W, 26 August 1985, 1 ♂, D.J. Buckle, DMNS ZA.31365. *Saskatchewan*, 14 km SSW Dundurn, 51.68°N, 106.58°W, 22 July 1972, slough margin, 1 ♂, D.J. Buckle, DMNS ZA. 14495. *Saskatchewan*, Hodgeville, 719 m, 50.11°N, 106.97°W, 22 July–10 August 1996, pitfall traps, rail line, 1 ♂, K. Pivnick, DMNS ZA.31400. *Saskatchewan*, Hodgeville, 50.12°N, 106.98°W, 10–27 August 1996, pitfall traps, 1 ♂, K. Pivnick, DMNS ZA.31405. *Saskatchewan*, Hodgeville, 719 m, 50.11°N, 106.97°W, 1–21 August 1995, rail line, pitfall traps, 1 ♂, K. Pivnick, DMNS ZA.31399. *Saskatchewan*, Lady Lake, 51.05°N, 102.63°W, summer 1963, 1 ♂, M. Buckle, DMNS ZA.31395. *Saskatchewan*, 8 km east of Marcelin, 52.82°N, 109.70°W, 11 August 1986, 1 ♂, D.J. Buckle, DMNS ZA.31411. *Saskatchewan*, North Battleford, 52.77°N, 106.67°W, 7–26 August 1996, pitfall traps, 3 ♂, K. Pivnick, DMNS ZA.31402. *Saskatchewan*, Radville, 625 m, 49.46°N, 104.29°W, 20 July 1967, 1 ♂, D.J. Buckle, DMNS ZA. 31398. *Saskatchewan*, Saskatoon, 52.13°N, 106.67°W, 13 July 1980, in web in tall grass, 1 ♂, D.J. Buckle, DMNS ZA.31403. *Saskatchewan*, Saskatoon, 52.13°N, 106.67°W, 13 August 1982, 2 ♂, 3 ♀, D. J. Buckle, DMNS ZA.31409. *Saskatchewan*, 8 km NE of Saskatoon, 505 m, 52.23°N, 106.52°W, 10–17 August 1967, 5 ♂, E. Corin, ZA.31397. *Saskatchewan*, St. Denis, Champetre, 560 m, 52.16°N, 106.10°W, 8–23 August 1996, native grass & trees, pitfall traps, 3 ♂, K. Pivnick, DMNS ZA.31401. *Saskatchewan*, St. Denis, 52.16°N, 106.10°W, 560 m, 20 July–7 August 1955, cultivated trees, pitfall traps, K. Pivnick, 1 ♂, DMNS ZA.31408. USA: *Oregon*, Benton County, Corvallis, 44°N, 123°W, 1 November 1950, 1 ♀, V. Roth, AMNH. *Oregon*, Benton County, 19 km north of Corvallis, 44°N, 123°W, 25 September 1947, 1 ♀, V. Roth, AMNH. *Oregon*, Benton County, 44°N, 123°W, 28 September 1952, 1 ♀, G. Konnersman, AMNH. *Oregon*, Jackson County, 42°N, 122°W, 1935, 1 ♀, F. Lawrence, AMNH. *Oregon*, Lane County, Eugene, 44°N, 123°W, 13 September 1941, Spencer Butte, 1 ♀, B. Malkin, AMNH. *Washington*, Grays Harbor County, Ford Prairie, 46.87°N, 123.29°W, 20 June 2007, 15–18 m, from ground web on prairie; reared–2 molts, 1 ♂, L. Ramseyer, UWBM.2. *Washington*, Island County, Oak Harbor, 18 September 1935, 1 ♀, C.H. Harrison, UWBM.12.

Agelenopsis aleenae (Chamberlin & Ivie 1935)

Agelenopsis aleenae Chamberlin & Ivie 1935: 33, pl. 14, f. 111. Figs. 1, 2, 34, 49, 61D

Type specimens.—Male holotype examined: *New Mexico*: Valencia County, Suwanee (Correo) 35°N, 107.08°W, 6 September 1933, found under a rock on a dry hillside, Aleen Ivie, AMNH.

Etymology.—Named for Aleen Ivie, wife of arachnologist Wilton Ivie, who collected the specimen.

Diagnosis.—The male *A. aleenae* is distinguished by its tight coiling embolus, diameter of coiling not substantially wider than cymbium width, and spatulate embolic tip (Figs. 1, 2). The conducting tube in the female is unique in its flared and thickened shape as it emerges high in the bursa's structure and descends to its base where it enters the spermatheca (Fig. 49, "ct").

Description.—General description as for the genus. Male ($n = 10$): overall length 8.85–13.80 mm; carapace width at its widest point 3.13–4.33 mm; carapace width at its narrowest point 1.71–2.28 mm. Shape of RTA is nipple-like; shape of median apophysis is thick, but somewhat pointed; conductor size is large with generally pointed shape; coiling of embolus is tight with an embolic tip termination angle of 540°; embolus subtriangular segment is absent; embolic tip orientation is not recurved; embolic tip is twisted and spatulate; anelli on subtegulum are present (Figs. 1, 2). Female ($n = 24$): overall length 8.90–15.95 mm; carapace width at its widest point 3.03–4.61 mm; carapace width at its narrowest point 1.59–2.64 mm. Bursa is longer than wide, tip folded strongly ventrally, narrowly separated from or touching other bursa; spermatheca is elongated and kidney shaped; two turns of the fertilization ducts; spermathecae are touching, oriented longitudinally, and sit centrally between bursae; conducting tube emerges and descends steeply from upper portion of bursa, then splits, thickens (obscuring view of almost entire surface of spermatheca), and converges entering spermatheca vertically, but at posterior (bottom) edge; very long conducting tube on ventral side; diverticle is bulbous and same size as spermatheca, and does not touch the other; anterior atrial edge is monolobed; epigynal bridge is thin and wide; bursa opening is mostly visible (Fig. 34, "bo").

Distribution.—USA: *Colorado*, *Kansas*, *New Mexico*, *Texas* (Fig. 61D).

Material examined.—USA: *Colorado*, Cheyenne County, Kit Carson, 38.76°N, 102.79°W, 19 September 1999, grassland, 1 ♀, 1 ♂, L. & M. Siderhurst, DMNS ZA.11437. *Colorado*, Las Animas County, Piñon Canyon Maneuver Site, off Rd. 4 A, 37.42°N, 103.85°W, 13 September 2006, 1539 m, 1 ♀, P.E. Cushing, DMNS ZA.11491. *Colorado*, Las Animas County, Piñon Canyon Maneuver Site, canyon feeding into Toyler Arroyo near Biernack Barracks, 37.41°N, 103.88°W, 12 September 2006, 1524 m, 21:00–22:30 hr, headlamping, 1 ♂, J. Slowik, DMNS ZA.14493. *Colorado*, Las Animas County, Piñon Canyon Maneuver Site, windmill of Rd. 3A, 13 September 2006, 37.42°N, 103.94°W, 1515 m, 16:00–16:30 hr, lookdown, J. Slowik, DMNS ZA.14494. *Colorado*, Las Animas County, Piñon Canyon Maneuver Site, windmill along Road 2, 37.39°N, 104.03°W, 13 September 2006, 1546 m, short grass prairie, moist site, 1 ♀, J. Demboski, DMNS ZA.14495. *Colorado*, Las Animas County, Piñon Canyon

Maneuver Site, off Rd. 3A, 37.42°N, 103.94°W, 13 September 2006, 1515 m, 16:20–16:40 hr, 1♀, P.E. Cushing, DMNS ZA.14496. *Colorado*, Las Animas County, off Rd. 4, 37.43°N, 103.94°W, 13 September 2006, 1544 m, 1♀, J. Demboski, DMNS ZA.14497. *Colorado*, Otero County, Comanche National Grasslands, 21 km S of La Junta, 5 km W of CR 802, David Canyon Rd., 37.79°N, 103.52°W, 19 September 2009, 1360 m, lookdown, 12:10–16:30 hr, open short grass, 4♀, M. Francis & J. Whitman-Zai, DMNS ZA.22371.

Colorado, Prowers County, Lamar, Road DD, 38.09°N, 102.62°W, 15 September 2003, trap 7, 8, pitfall, 1104 m, 1♂, H. Miller, DMNS ZA.21314. *Colorado*, Prowers County, Lamar, Rd. DD, 38.09°N, 103.61°W, 22 September 2005, 1104 m, trap 13, 14, fallow alfalfa field, 1♂, L. Kerzicnik, DMNS ZA.21319. *Colorado*, Prowers County, Lamar, Rd. DD, 38.09°N, 103.62°W, 22 September 2005, 1104 m, trap 21, 22, fallow sorghum field, 1♂, L. Kerzicnik, DMNS ZA.21487. *Colorado*, Prowers County, Lamar, 38.09°N, 102.62°W, 3 October 2006, Rd. DD, 1104 m, trap 25, 26, pitfall, 1♀, L. Kerzicnik, DMNS ZA.21486. *Colorado*, Prowers County, S of Lamar, off Trail Rd. by deserted house off CR 2, N 37.97°N, 102.72°W, 18 September 2009, 4♀, 1197 m, lookdown, 13:20–14:22 hr, M. Francis & J. Whitman-Zai, DMNS ZA.22370.

Kansas, Meade County, Meade State Park, 37.17°N, 100.45°W, 15 August 2004, 1♂, N. Ayoub, CAS. *New Mexico*, Colfax County, Farley, 2 August 1991, under boards & sheet metal at abandoned farm, 1♀, 1♂, H.S. Fitch, HJG.649. *New Mexico*, Colfax County, 5 km N of Farley off County Road 193, 37.23°N, 104.49°W, 5 August 2009, look down in weeds by culvert, 1♀, M. Francis & J. Whitman-Zai, DMNS ZA.22599. *New Mexico*, Colfax County, 7 km N of Farley, County Road 193 before mile marker 7, 37.40°N, 104.48°W, 5 August 2009, 1♀, 1846 m, look down, 15:00–15:30 hr in weeds near culvert, M. Francis & J. Whitman-Zai, DMNS ZA.22173. *New Mexico*, Colfax County, 7 km N of Farley, 6–7 August 2009, CR 193 before mile marker 7, 37.22°N, 104.48°W, 1846 m, pitfall in weeds near culvert, 2♀, M. Francis & J. Whitman-Zai, DMNS ZA.22174. *New Mexico*, Union County, off Morrow Rd. just W of Capulin National Monument, 36.78°N, 103.99°W, 7 August 2009, 2218 m, look down, 14:30–14:40 hr, 1♀, M. Francis & J. Whitman-Zai, DMNS ZA.22598. *Texas*, Howard County, Big Spring, random salt cedar, 17 September 2006, 1♀, E.M. Knutson, NMSU.992. *Texas*, Llano County, 30°N, 98°W, 2♂, 1 October 1950, 1♂, W.J. Gertsch, AMNH. *Texas*, Reeves County, 16 km S of Balmorhea, 30.85°N, 103.80°W, 19 May 2003, 1♂, N. Ayoub et al., CAS.

Agelenopsis aperta (Gertsch 1934)

Agelela aperta Gertsch 1934: 25, f.10.

Figs. 23, 24, 41, 56, 57, 61D

Type specimens.—Male holotype and female allotype examined: *Colorado*, Boulder County, Valmont Buttes, east of Boulder, 27 July 1908, 40.07°N, 105.13°W, F.E. Lutz, AMNH. Paratypes examined: *Colorado*, Boulder County, Valmont Buttes east of Boulder, 27 July 1908, 40.07°N, 105.13°W, F.E. Lutz, AMNH; *California*: Los Angeles County, Los Angeles, November, December 1931, Grant, AMNH; *Texas*, Travis County, Austin, Cockrell, September 1901, Petrunkevitch, AMNH; *Utah*, Salt Lake County, Salt

Lake City July, September 1931, AMNH; *Utah*, Washington County, Zion National Park, 4 July 1931, Gertsch, AMNH.

Etymology.—None provided but “apertum” in Latin means “opening” and may refer to the distinctive atrium of the female.

Diagnosis.—The male *A. aperta* is distinguished from other species in the genus by its loosely coiling embolus, making more than one full circle, a procurved and twisting tip, and a pointed conductor tip (Figs. 23, 24). The *A. aperta* female has a unique diverticle and conducting tube that diverges and converges before entering the spermatheca, remaining thin and distinctive (Figs. 56, 57).

Description.—General description as for the genus. Male ($n = 29$): overall length 9.40–15.14 mm; carapace width at its widest point 3.19–5.14 mm; carapace width at its narrowest point 1.74–3.81 mm. Shape of RTA is nipple-like; shape of median apophysis is thick and somewhat pointed; conductor size is large with generally pointed shape; coiling of embolus is loose with an embolic tip termination angle of 540°; embolus subtriangular segment is absent; embolic tip orientation is not recurved; embolic tip is twisted; anelli on subtegulum are present (Figs. 23, 24). Female ($n = 27$): overall length 11.03–15.92 mm; carapace width at its widest point 3.57–5.44 mm; carapace width at its narrowest point 1.92–3.34 mm. Bursa longer than wide, oriented vertically, tips ventrally, narrowly separated from or touching other bursa; spermatheca is tear-shaped, set centrally with respect to bursa, and oriented longitudinally; spermathecae touching; two turns of fertilization ducts are visible; conducting tubes diverge and then converge before entering spermatheca centrally on dorsal side from a vertical position; diverticle is a curved, thickened tube much larger than spermatheca and slightly separated from other; anterior atrial edge is slightly bilobed; epigynal bridge is thin and wide; bursa opening is mostly visible (Figs 41, 56, 57).

Distribution.—USA: *Arizona*, *California*, *Colorado*, *Nebraska*, *New Mexico*, *Nevada*, *Oklahoma*, *Utah*, *Texas* (Fig. 61D).

Material examined.—USA: *Arizona*, Cochise County, SWRS, Chiricahua Mtns., 31°N, 109°W, 26 August 1955, 1♀, 1♂, W.J. Gertsch, AMNH. *Arizona*, Cochise County, SW Research Station, 8 km west of Portal, 25 July 1956, 1♀, M.J. Westfall, AMNH. *Arizona*, Cochise County, 8 km west of Portal, SW Research Station, 7 August 1956, 1♂, M.J. Westfall, AMNH. *Arizona*, Cochise County, SWRS, Chiricahua Mtns., 31°N, 109°W, 10 August 1956, 1♂, no collector listed, AMNH. *Arizona*, Cochise County, Portal SW Research Station, 27 August 1958, on building, 1♀, H.V. Weems, Jr., AMNH. *Arizona*, Cochise County, 8 km W of Portal, SW Research Station, 10 September 1958, 1♂, H.V. Weems, Jr., AMNH. *Arizona*, Cochise County, Portal, Chiricahua Mtns, 31°N, 109°W, 18 June 1955, 1♂, no collector listed, AMNH. *Arizona*, Cochise County, Portal, Chiricahua Mtns., 31°N, 109°W, 18 June 1955, 1♂, M. Statham, AMNH. *Arizona*, Cochise County, 31°N, 109°W, no collection date listed, 1♀, no collector listed, AMNH. *Arizona*, Cochise County, Portal 1, 1455 m, 31.91°N, 109.14°W, 1 July 1978, 1♂, B. & C. Durden, DMNS ZA.137. *Arizona*, Cochise County, Herb Martyr Dam S. of Portal, 31.87°N, 109.23°W, 9 August 1972, 1♂, B. Vogel, DMNS ZA.11808. *Arizona*, Maricopa County, 2 km N of

New River September 1966, 1♀, 1♂, no collector listed, MCZ.39996.

Arizona, Pinal County, San Manuel, 32 km S of Redington, August 1977, 1♂, W.J. Gertsch, AMNH. *California*, Los Angeles County, 10 August 1932, La Crescenta, 1♀, W. Ivie, AMNH. *California*, Los Angeles County, San Fernando, 34.28°N, 118.47°W, 14 September 1964, 2♀, W. Ivie, AMNH. *California*, Los Angeles County, Sepulveda Canyon, 34°N, 118°W, 17 September 1941, 1♀, W. Ivie, AMNH. *California*, Orange County, Banning Canyon, 33°N, 116°W, 18 May 1951, 1♀, 1♂, E. Schlinger, AMNH. *California*, Tulare County, Three Rivers, 250 m, 21 June 1985, 2♀, 3♂, H. & L. Levi, MCZ.39997. *Colorado*, Adams County, Aurora, 63485 S Yellowstone Court, 80016, 39.60°N, 104.72°W, 6–9 September 2000, 1♀, G. Schmidt, DMNS ZA.13345. *Colorado*, Arapahoe County, Aurora, 18939 E. Warren Circle, #102, 39.83°N, 104.76°W, 22 August 2003, 1♂, B. Nelson, DMNS ZA.6284. *Colorado*, Arapahoe County, Greenwood Village, 100 Blue Heron Court, 39.62°N, 104.93°W, 3 October 2000, 1♀, A. Gilden, DMNS ZA.4964. *Colorado*, Arapahoe County, Old Littleton, 39.61°N, 105.02°W, 1643 m, 12 June 2001, 1♂, T. Adair, DMNS ZA.11442. *Colorado*, Boulder County, 40.02°N, 105.31°W, 13 July 1962, 1♀, B. Vogel, DMNS ZA.1913. *Colorado*, Boulder County, 18 July 1962, 2♂, B. Vogel, CU.6. *Colorado*, Boulder County, South of County Rd. 67, 39.91°N, 105.27°W, 5 July 1999, 1♂, 10:00–14:00 hr, 4 hr cumulative, look down; 2 hr cumulative look up, L. & M. Siderhurst, DMNS ZA.11382. *Colorado*, Douglas County, Roxborough State Park near visitor center, 39.42°N, 105.05°W, 18 September 1999, 1♀, 11:00–12:00 hr, R. Burleigh, DMNS ZA.13364. *Colorado*, Douglas County, Sedalia, 2691 W. Wolfensberger Rd., 1775 m, 39.44°N, 104.96°W, 15–18 August 1998, 1♂, G. Dennison, DMNS ZA.4972. *Colorado*, El Paso County, 2 km W of Monument off Mt. Herman Rd. 320, 39.08°N, 104.89°W, 07 September 2001, 1♀, 2101 m, B. Morrison, DMNS ZA.4786. *Colorado*, Elbert County, Elizabeth, 627 Panorama Dr., 39.36°N, 104.60°W, 31 July–19 August 2002, 1♂, casual, C.J. Bishop, DMNS ZA.9040. *Colorado*, Jefferson County, Butterfly Pavilion and Insect Center, Westminster, 39.88°N, 105.05°W, 9 July 2005, 1♂, 9 July 2005, 1♂, P.E. Cushing & F. Haas, DMNS ZA.11209. *Colorado*, Jefferson County, Morrison, 5591 Willow Wood, 39.63°N, 105.27°W, 2 July 2002, 1♂, R. L. Harwood, DMNS ZA.4977. *Colorado*, Montezuma County, Mesa Verde NP, around research center, 37.15°N, 108.51°W, 31 July 2001, 1♀, casual collecting, A.R. Nabors, DMNS ZA.11974. *Nebraska*, Buffalo County, Amherst, October 1971, 1♀, L. Alexander, MCZ.40000. *Nevada*, Clark County, Las Vegas, 36°N, 115°W, 27 July 1944, 1♀, D. Zinn, AMNH. *Nevada*, Washoe County, Reno, U of Nevada College Quad, 39°N, 119°W, July 1940, 1♀, no collector listed, AMNH. *New Mexico*, Doña Ana County, November 1980, 1♀, 1♂, Las Cruces, no collector listed, USNM.A2. *New Mexico*, Hidalgo County, Gray Ranch Survey, Upshaw Camp, draw to S., 8 August 1991, 1♂, D. Richman, NMSU.A3. *New Mexico*, Hidalgo County, 8 August 1991, 1♂, Upshaw Camp; draw to south, D. Richman et al., NMSU.B2. *New Mexico*, Otero County, High Rolls Mtn. Park, 4 April 1966, 1♂, L. Pinter, MCZ.39998. *Oklahoma*, Comanche County, Fort Sill, Lake Elmer Thomas Recreation Area (LETRA), 34.72°N, 98.53°W, 442 m, 20

September 2003, 1♀, lockdown 11:40–12:40 hr, P.E. Cushing, DMNS ZA.7056. *Texas*, Bandera County, 29°N, 99°W, 1 August 1940, 1♀, D. & S. Mulaik, AMNH. *Texas*, El Paso County, Clint, 31°N, 106°W, 9 June 1939, 1♀, I.R. Davis, AMNH. *Texas*, Fort Bend County, Needville, 17 June 1978, 1♂, in web at base of house, D.A. Dean, TXAM.535. *Texas*, Travis County, Austin, 30.39°N, 97.73°W, 25 August 1968, 2♀, B. Vogel, DMNS ZA.154. *Utah*, Salt Lake, 1936 (only year provided on label), 1♀, M.J. Westfall, AMNH.

Ageleuopsis emertoni (Chamberlin & Ivie 1935)

Ageleuopsis emertoni Chamberlin & Ivie 1935: 33, pl. 14, f.110.

Figs. 25, 26, 42, 58, 61C

Type specimens.—Male holotype, female allotype examined, *Texas*, Bell County, Belton, 31.07°N, 97.28°W, 1 September 1933, W. Ivie, AMNH.

Etymology.—Named for arachnologist James H. Emerton.

Diagnosis.—The male *A. emertoni* is distinguished from other species in the genus by its loosely coiling embolus, making more than one full circle, a procurved and twisting tip, and a claw-like conductor tip (Figs. 25, 26). The female is distinctive for having a conducting tube that descends straight from bursa but angles sharply ectally to enter a spermatheca with a flanged tip (Fig. 58).

Description.—General description as for the genus. Male ($n = 28$): overall length 6.00–12.57 mm; carapace width at its widest point 2.25–4.34 mm; carapace width at its narrowest point 1.12–2.23 mm. Shape of RTA is nipple-like; shape of median apophysis is thick and somewhat pointed; conductor size is large with a claw-like shape; coiling of embolus is loose with an embolic tip termination angle of 540°; embolus subtriangular segment is present; embolic tip orientation is not recurved; embolic tip is twisted; anelli on subtegulum are present (Figs. 25, 26). Female ($n = 27$): overall length 7.20–15.17 mm; carapace at its widest point 2.20–4.82 mm; carapace at its narrowest point 1.15–2.81 mm. Bursa is generally rigid and inflated, oriented ventrally; bursae narrowly spaced or touch distally but more widely set at base; spermatheca is kidney-bean shaped but narrows and is flanged dorsally, is separated from the other, sits dorsally of bursae, and oriented generally longitudinally; two turns of fertilization ducts visible; conducting tube descends from bursa to spermatheca straightforwardly and then angles ectally toward outer sides on anterior edges where it enters the spermatheca; diverticle is a curved, thickened tube, larger than the spermatheca, and touches other diverticle; anterior atrial edge is slightly bilobed; epigynal bridge is thin and wide; bursa opening is mostly visible (Figs. 42, 58).

Distribution.—USA: *Arkansas*, *Colorado*, *Florida*, *Georgia*, *Louisiana*, *Massachusetts*, *Mississippi*, *Missouri*, *New Jersey*, *New York*, *North Carolina*, *Oklahoma*, *Pennsylvania*, *Tennessee*, *Texas*, *Virginia* (Fig. 61C).

Material examined.—USA: *Arkansas*, Lawrence County, Imboden, 36.2°N, 91.17°W, 1935 (only collection year listed), 3♀, 1♂, A. C. Marshall, AMNH. *Colorado*, Douglas County, Castlewood Canyon State Park, 39.35°N, 104.76°W, 14 August 1999, 1♀, 11:00–12:30 hr, J. Dickinson, DMNS ZA.4774. *Colorado*, Jefferson County, Littleton, Chatfield SP, Hwy 121 & C470, 39.52°N, 105.08°W, 7 October 2004, 1♀, 1580 m, under bark of cottonwoods & willows, B. Morrison,

DMNS ZA.8165. *Colorado*, Montezuma County, Mesa Verde NP, Chapin Mesa, 39.18°N, 108.15°W, 5 June–30 September 2006, 1♂, 2135 m, inside dwelling, D.L. Ely, DMNS ZA.12950. *Florida*, Alachua County, Gainesville, DPI (Division of Plant Industry), 3 November 1981, 1♂, G.B. Edwards, FSCA. *Florida*, Alachua County, Gainesville, DPI, 19 December 1981, 3♂, G.B. Edwards, FSCA. *Georgia*, Ben Hill County, Fitzgerald, in pecan grove, 12 September 1950, 1♂, M. Hopkins, FSCA. *Louisiana*, Baton Rouge Parish, 30°N, 91°W, July 1955, 1♀, 1♂, R.V. Chamberlin & W. Ivie, AMNH. *Massachusetts*, Barnstable County, Quisset Salt Pond, 8 October 1988, 1♀, R. L. Edwards, USNM. *Mississippi*, Tishomingo County, Luka, 34°N, 88°W, 5 September 1941, 1♂, C. Goodnight, AMNH. *Missouri*, Vernon County, Nevada, 8 October 1962, 1♀, 1♂, on store front, J.W. McReynolds, MCZ.39986. *New Jersey*, Bergen County, Ramsey, 10 October 1933, 2♂, 41°N, 74°W, W.J. Gertsch, AMNH. *New Jersey* Monmouth County, Red Bank, September 1958, 1♀, R. Willey, MCZ.39988. *New York*, Suffolk County, Greenport, Long Island, 41°N, 72°W, September 1957, 1♂, R. Latham, AMNH. *New York*, Suffolk County, 22 September 1922, 2♂, Riverhead, 40°N, 72°W, M.I. King, AMNH. *North Carolina*, Durham County, Duke Forest, summer 1938, 1♀, A.M. Chickering, MCZ.39995. *Oklahoma*, Comanche County, Fort Sill, E. Cache Creek, 34.64°N, 98.36°W, 3 October 2004, 1♀, 326 m, 12:00–13:00 hr, in woods above stream, look down, P.E. Cushing, DMNS ZA.7339. *Oklahoma*, Payne County, Stillwater, 36°N, 96°W, 1936 (only collection year listed), 1♀, 1♂, C. Smith, AMNH. *Pennsylvania*, Bucks County, Neshaminy Creek, 0.6 km east of Jamison, 40.16°N, 75.03°W, September 1952, 2♀, 2♂, no collector listed but probably W. Ivie, AMNH. *Pennsylvania*, Bucks County, Neshaminy Creek, northeast of Jamison, 40.16°N, 75.30°W, 16 September 1962, 3♀, no collector listed but probably W. Ivie, AMNH. *Pennsylvania*, Bucks County, NE of Jamison, Horseshoe Bend, Neshaminy Creek, 40.27°N, 75.05°W, August 1956, 4♀, 4♂, W. Ivie, AMNH. *Pennsylvania*, Columbia County, Orangeville, 41°N, 76°W, August 1931, 1♂, Hughes, AMNH. *Tennessee*, Jackson County, Cherry Cove, Bailey, 19 October 1948, 1♀, Jones & Archer, AMNH. *Texas*, Bastrop County, Little Sandy Creek, 16 km NW Bastrop, 28 October 1971, 1♂, B. Vogel, DMNS ZA.150. *Texas*, Belton County, 31°N, 97°W, 01 September 1933, 1♀, 1♂, W. Ivie, AMNH. *Texas*, Dallas County, White Rock, 10 September 1939, 1♂, V. Roth, MCZ.39994. *Texas*, Grayson County, 10 km N of Denison, 33.52°N, 96.34°W, 20 October, 1963, 3♀, K.W. Haller, AMNH. *Texas*, Nuscus County, 6 km NW Port Aransas, 8 October 1972, 1♀, moist salt beach, B. Vogel, DMNS ZA.146. *Virginia*, Albemarle County, 27 August 1948, 1♂, H.K. Wallace, FSCA.

Agelenopsis kastoni (Chamberlin & Ivie 1941)

Agelenopsis kastoni Chamberlin & Ivie 1941: 591,

pl. 2, fig. 18, 35.

Figs. 19, 20, 39, 54, 61A

Type specimens.—Male holotype, female allotype examined. *Connecticut*, Middlesex County, Haddam, 41.47°N, 72.52°W, 27 May 1935, B. J. Kaston, AMNH.

Etymology.—Named for arachnologist Benjamin J. Kaston who collected the holotype.

Diagnosis.—The male of this species is distinguishable from others in the genus by its loosely coiling, recurved embolus, making more than one full circle and ending in a smooth, tapering tip (Figs. 19, 20). The female *A. kastoni* is distinctive in having a particularly dark, sclerotized fertilization duct and spermatheca that is thickened and flanged out on dorsal side (Fig. 54).

Description.—General description as for the genus. Male ($n = 22$): overall length 6.20–8.80 mm; carapace width at its widest point 2.00–2.95 mm; carapace width at its narrowest point 1.22–1.58 mm. Shape of RTA is nipple-like; shape of median apophysis is thick and somewhat pointed; conductor size is large with generally pointed shape; coiling of embolus is loose with an embolic tip termination angle of 540°; embolus subtriangular segment is absent; embolic tip orientation is recurved; embolic tip is slender and tapering; anneli on subtegulum are present (Figs. 19, 20). Female ($n = 52$): overall length 4.00–10.29 mm; carapace width at its widest point 1.49–2.90 mm; carapace width at its narrowest point 0.82–1.71 mm. Bursa angles toward other, touching distally but set wide apart at base, vertically oriented when viewed from above; spermatheca is kidney shaped, oriented longitudinally, nestled centrally in bursae; spermathecae touching; two turns of fertilization ducts visible; diverticle is bulbous and same size as spermatheca; slightly separated from other; conducting tube pattern complex with convoluted loops; anterior atrial edge is bilobed; epigynal bridge is thin and wide; bursa opening is mostly visible (Figs. 39, 54).

Distribution.—USA: *Arkansas*, *Connecticut*, *Florida*, *Georgia*, *New Jersey*, *New Mexico*, *Massachusetts*, *Maryland*, *Missouri*, *North Carolina*, *Tennessee*, *West Virginia* (Fig. 61A).

Material examined.—USA: *Arkansas*, Logan County, Mt. Magazine, Mossback Ridge, north slope, 23 June 1990, pitfall, 1♀, B. Leary, AMNH. *Arkansas*, Washington County, Cove Creek Valley, 24 km west of Prairie Grove, Boston Mtns. Mareh–April 1956, 12♀, 5♂, 305 m, M. Hite, MCZ.39968. *Arkansas*, Washington County, Cove Creek, 12 May 1963, 1♀, O. & M. Hite, Whitcomb, & Frizzell, AMNH. *Connecticut*, Middlesex County, Haddam, 27 May 1935, 1♀, 1♂, B. J. Kaston. *Connecticut*, New London County, Waterford, 30 June 1935, 1♂, B.J. Kaston, AMNH. *Florida*, Liberty County, Torreya State Park, 2 April 1963, 2♂, W. Shear, AMNH. *Florida*, Liberty County, Torreya State Park, 21 km north of Bristol, 18 December 1967, 1♂, W. Ivie, AMNH. *Georgia*, Clayton County, NW Clayton, 34.88°N, 83.47°W, 28 April 1943, 12♀, W. Ivie, AMNH. *Georgia*, Habersham County, Clarkesville, 34.60°N, 83.52°W, 27 April 1943, 4♀, W. Ivie, AMNH. *Georgia*, Habersham County, Tallulah Falls, 34.75°N, 83.42°W, 27 April 1943, 4♀, W. Ivie, AMNH (2 sets of vials with same collection information and 4♂s each). *Georgia*, Habersham and Stephens Counties, Clarkesville to Toccoa, 34.58°N, 83.42°W, 28 April 1943, 4♀, W. Ivie, AMNH. *Georgia*, Hall County, 8 km NE of Gainesville, 34.33°N, 83.77°W, 26 April 1943, 2♀, W. Ivie, AMNH. *Georgia*, Rabun County, NW Clayton, 34.88°N, 83.47°W, 28 April 1943, 4♀, 4♂, W. Ivie, AMNH. *New Jersey*, Burlington County, Lebanon State Forest, 39.55°N, 74.37°W, 10 May 1964, 1♀, J. & W. Ivie, AMNH. *Maryland*, Prince Georges County, Patuxent Game Refuge, Bowie, 39°N, 76°W, May 1941, 1♂, L.W. Saylor, AMNH. *Maryland*, Prince Georges

County, 27 May–4 June 1978, 1♂, J.F. Reinert, USNM. *Massachusetts*, Barnstable County, Hatchville, FCWMA, 28 July 1989, pitfall, deciduous woods, 1♀, R.L. Edwards, USNM. *Massachusetts*, Plymouth County, Wareham, 17 June 1960, 1♂, B.J. Kaston, USNM. *North Carolina*, Durham County, Kerley Rd., about 213 m west of 751, Duke Forest (stand 25 years old), 23 April 1964, pitfalls, pine with young hardwood, 1♂, J.W. Berry, USNM. *Tennessee*, Anderson County, Norris, 1 May 1975, rock outcrop, found on sheet web, 1♂, A. Kronk, USNM. *West Virginia*, Berkeley County, Sleepy Creek Hunt and Fish Area, Third Hill Mtn., 16–23 May 1986, 1♂, unbaited pitfall trap, P5 New S.W., P.J. Martinat, USNM. *West Virginia*, Berkeley County, Sleepy Creek Hunt & Fish Area, Third Hill Mountain, 23–30 May 1986, oak-pine forest, unbaited pitfall trap, 1♂, P.J. Martinat, USNM. *West Virginia*, Berkeley County, 1986, Sleepy Creek Hunt & Fish Area, Third Hill Mountain, 20–27 June 1986, unbaited pitfall trap, 5 New NW, 1♀, J.P. Martinat, USNM.

Agelenopsis longistyla (Banks 1901)

Ageleua longistylus Banks 1901: 576.

Figs. 15, 16, 40, 55, 61B

Type specimens.—Male holotype not examined. *New Mexico*, Lincoln County, White Mountains, first Ruidoso camp, 10 August, 1901, C.H.T. Townsend.

Etymology.—Named for the male's distinctive, long, hooked embolic tip.

Diagnosis.—The male *A. longistyla* is distinguishable from other species in this genus by its loosely coiling embolus, with pronounced procurved, hooked tip (Figs. 15, 16). The female, like *A. aleenae*, is distinguishable from most other species in this genus by its very wide set bursae but is the only species with a curved tubular diverticle that is thin (Fig. 55).

Description.—General description as for the genus. Male ($n = 17$): overall length 6.2–8.3 mm; carapace width at its widest point 1.81–2.59 mm; carapace width at its narrowest point 1.01–1.51 mm. Shape of RTA is nipple-like; shape of median apophysis is thick and somewhat pointed; conductor size is large with generally pointed shape; coiling of embolus is loose with an embolic tip termination angle of 720°; embolus subtriangular segment is absent; embolic tip orientation is not recurved; embolic tip is hooked with notch; anneli on subtegulum are present (Figs. 15, 16). Female ($n = 58$): overall length 2.6–3.88 mm; carapace width at its widest point 1.83–2.8 mm; carapace width at its narrowest point 1.0–1.47 mm. Bursa is longer than wide, oriented ventrally, and widely spaced from other; spermatheca is tear-shaped, widely set apart from the other, longitudinally oriented, and nestled between bursae; two turns of fertilization ducts are visible; conducting tube enters spermatheca at the very top (anterior edge); diverticle is curved, thin tube about the same size as spermatheca and widely spaced from other; anterior atrial edge distinctly bilobed; epigynal bridge thin and wide; bursa opening partially visible (Figs. 40, 55).

Distribution.—USA: *Arizona*, *Colorado*, *New Mexico*, *Texas* (Fig. 61B).

Material examined.—USA: *Arizona*, Navajo County, Overgaard Camp, 10 km north of Heber, 34°N, 110°W, 17 September 1950, 2♀, W.J. Gertsch, AMNH. *Colorado*, Alamosa County, San Luis Lakes State Park, 37.67°N,

105.72°W, 11 September 1999, 11:00–12:30 hr, 1♀, P.E. Cushing, DMNS ZA.13352. *Colorado*, Conejos County, 18 Rd Antonito, 37.08°N, 106.01°W, 9 September 2001, under rock, 1♀, N. Betzen, DMNS ZA.13471. *Colorado*, Douglas County, Castle Rock, Gateway Mesa Park, 39.39°N, 104.80°W, 24 August 2005, 1951 m, look down in grass, 12:59 hr, foothills, 1♂, B. Morrison, DMNS ZA.12048. *Colorado*, Saguache County, Friendly Gulch, 38.10°N, 106.18°W, 9–18 September 1999, 4♂, P.M. Pineda, DMNS ZA.9036. *Colorado*, Saguache County, Friendly Gulch, 38.10°N, 106.18°W, 9–18 August 1999, 4♂, pitfall trap, P.M. Pineda, DMNS ZA.9037. *Colorado*, Weld County, C.P.E.R. Pawnee National Grassland, Pasture 23 W, 11 August 1994, 1♂, R.D. Weeks, Jr., NMSU.190. *New Mexico*, Grant County, 1♂, Burro Mtns., piñon juniper/molina, 1 September 1973, M.H. Muma, FSCA.9. *New Mexico*, Grant County, Emory Pass Summit, Nimbres Mtns., 32.83°N, 107.75°W, 6 September 1941, 4♀, W. Ivie, AMNH. *New Mexico*, Grant County, Silver City, 1 September 1972, ear trap in piñon juniper, 1♀, M.H. Muma, FSCA.7. *New Mexico*, Grant County, Silver City, 16 August 1973, 1♀, 1♂, M.H. Muma, FSCA.5. *New Mexico*, Grant County, Silver City, 3 December 1973, 1♀, M.H. Muma, FSCA.8. *New Mexico*, Grant County, Silver City, 1 September 1973, 4♂, M.H. Muma, FSCA.6. *New Mexico*, Los Alamos County, Los Alamos, R Site Control, August–November 1976, pitfall trap, 1♂, D. Clowns, AMNH. *New Mexico*, Luna County, Nimbres Mtns., Rock Creek Camp, 32.83°N, 107.78°W, 7 September 1941, 3♀, W. Ivie, AMNH. *New Mexico*, Sierra County, 3 km west of Hillsboro, 32.93°N, 107.67°W, 6 September 1941, 1♀, W. Ivie, AMNH. *New Mexico*, Socorro County, south of Magdalena, 34.07°N, 107.27°W, 5 September 1941, 2 vials of 4♀ each, W. Ivie, AMNH. *New Mexico*, Socorro County, west of Socorro, 34.07°N, 106.97°W, 6 September 1941, 2♀, W. Ivie, AMNH. *New Mexico*, Valencia County, Bluewater Lake, 3 km SW of Bluewater Station, 35.28°N, 108.03°W, 4 September 1941, 2 vials of 4♀ each, W. Ivie, AMNH. *New Mexico*, Valencia County, west of Laguna, 35.07°N, 107.47°W, 5 September 1941, 3 vials with 4♀ each, 1 vial with 12♀, W. Ivie, AMNH. *Texas*, McCullough County, 60 km west of Brady, 31°N, 99°W, December 1939, 1♀, D. & S. Mulaik, AMNH. *Texas*, Oldham County, Adrian, 35°N, 104°W, 4 September 1933, 1♀, W. Ivie, AMNH.

Agelenopsis naevia (Walckenaer 1841)

Ageleua naevia Walckenaer 1841: 24.

Figs. 21, 22, 33, 48, 61A

Type specimens.—Holotype presumed missing. Type locality: *Georgia*.

Etymology.—None given, but “*naevus*” in Latin means pigmented, freckled, birthmark, perhaps indicative of the speckling along the abdominal sides, both in this species and the genus in general.

Diagnosis.—The male of this species can be separated from others in the genus by its loosely coiled embolus, making more than one full circle, and procurved, tapering tip (Figs. 21, 22). The spermatheca of the female sits well back ventrally of the bursa near the atrium and is only one of two species with a thick and short epigynal bridge (Figs. 33, 48).

Description.—General description as for the genus. Male ($n = 26$): overall length 12.06–16.73 mm; carapace width at its

widest point 3.82–5.12 mm; carapace width at its narrowest point 2.13–3.05 mm. Shape of RTA is nipple-like; shape of median apophysis is sharp; conductor size is large with generally pointed shape; coiling of embolus is loose with an embolic tip termination angle of 470°; embolus subtriangular segment is absent; embolic tip orientation is not recurved; embolic tip is slender and tapering; anneli on subtegulum are present (Figs. 21, 22). Female ($n = 23$): overall length 10.52–18.71 mm; carapace width at its widest point 3.52–5.49 mm; carapace width at its narrowest point 2.10–3.12 mm. Bursa is longer than wide, oriented with tips angled slightly dorsally, and narrowly spaced or touching other bursa distally but more widely spaced at base; spermatheca is heart shaped) with conducting tube entering in center of front (seems to diverge and then converge or tubes run parallel); spermathecae touching, set ventrally of bursae, and oriented longitudinally; two narrow turns of fertilization ducts visible; diverticle is thick, curved, and tubular and larger than spermatheca, narrowly separated from other; anterior atrial edge monolobed; epigynal bridge thick and short; bursa opening mostly visible (Figs. 33, 48).

Distribution.—USA: *Alabama*, Colorado, Delaware, Florida, Illinois, Maine, Michigan, Missouri, New Jersey, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Texas, Virginia, West Virginia (Fig. 61A).

Material examined.—USA: *Alabama*, Cleburne County, 9 September 1946, 1♂, H.K. Wallace, FSCA.1232. *Colorado*, Boulder County, 6 November 1960, 1♀, B. Vogel, CU.3. *Colorado*, Boulder County, 2 July 1963, 1♂, G. Patzer, CU.2. *Colorado*, Boulder County, 22 July 1963, 1♂, W.A. Weber, CU.1. *Colorado*, Boulder County, 24 July 1975, 1♂, W.L. Weber, CU.4. *Colorado*, Denver County, 17 July 1948, inside culvert near Hogback, 1♂, W. van Riper, CU.5. *Delaware*, New Castle County, Warwick, Lum's State Park, 14 August 1968, on weeds in grass, 2♀, A. Moreton, MCZ.40204. *Florida*, Alachua County, Gainesville, Division of Plant Industry, 3 November 1981, 1♂, G.B. Edwards, FSAC.1. *Florida*, Liberty County, Torreya State Park, 30.33°N, 84.57°W, 18 December 1967, 1♀, W. Ivie, AMNH. *Illinois*, Union County, Giant City State Park, 9 September 1958, 1♂, R. Willey, MCZ.40198. *Maine*, Bethel County, 44.40°N, 70.80°W, no collection date listed, 1♂, AMNH. *Michigan*, Livingston County, E.S. George Reserve, Grid: L-15, 9 August 1951, 1♀, in grass at barn, H.K. Wallace, AMNH. *Michigan*, Livingston County, E.S. George Reserve; Grid: I-6, 24 July 1951, 1♀, H.K. Wallace, AMNH. *Missouri*, Vernon County, Bronaugh, 28 August 1971, farm garage, 1♀, 1♂, D. Lamore, MCZ.40817. *New Jersey*, Bergen County, Ramsey, 41°N, 74°W, 19 August 1934, 1♂, Ramsey, W.J. Gertsch, AMNH. *New Jersey*, Oakland County, 41°N, 74°W, 4 August 1935, 1♀, 1♂, W.J. Gertsch, AMNH. *North Carolina*, McDowell County, Little Switzerland, 23 August 1930, 2♀, 1♂, W.S. Creighton, MCZ.40194. *North Carolina*, Stokes County, Hanging Rock State Park, 16 August 1968, in web on grass, 1♀, A. Moreton, MCZ.40191. *Ohio*, Hocking County, 8 August 1956, 1♀, R.E. Woodruff, AMNH. *Oklahoma*, Comanche County, Fort Sill, East Range near Sitting Bear Creek, 34.65°N, 98.37°W, 9 July 2004, 349 m, 10:00–11:00 hr, look down, 1♀, 1♂, P.E. Cushing, DMNS ZA.7052. *Oklahoma*, Comanche County, Fort Sill, Geronimo's grave site, 34.68°N, 98.37°W, 19 September, 2003, 1♀, P.E. Cushing, DMNS ZA.6867. *Oklahoma*, Comanche Coun-

ty, Fort Sill, East Range, Geronimo's gravesite in Apache cemetery, around gravestones, 34.70°N, 98.37°W, 2 October 2004, 1♀, 358 m, P.E. Cushing, DMNS ZA.7364. *Pennsylvania*, Jamison County, 3 km E Neshaminy Creek, August 1954, 1♀, 1♂, W. Ivie, AMNH. *Tennessee*, Sevier County, 5 km SW of Gaitlinburg, 35.68°N, 83.55°W, 14 October 1965, 1♀, J. & W. Ivie, AMNH. *Texas*, Anderson County, 17–26 July 2002, 1♂, 11 km east of center of Palestine, pitfall with wings, 31.75°N, 95.48°W, pine: 82.7%, J. Yantis, TXAM.2. *Texas*, Bastrop County, Little Sandy Creek, 16 km NW of Bastrop, 28 October 1971, 1♀, B. Vogel, DMNS ZA.160. *Texas*, Houston County, 10 km north of center of Ratcliff, 31.47°N, 95.13°W, 3–12 June 2002, pitfall, pine 74.3%, 4♂, J. Yantis, TXAM.3. *Texas*, Montgomery County, Decker's Prairie near Tomball, 17 August 1958, 1♀, A. Brady, MCZ.40199. *Texas*, Walker County, Huntsville, 1 km w. of Huntsville, 1♂, C.W. Agnew & D.A. Dean, TXAM.1. *Virginia*, Giles County, H.K. Wallace, FSCA.17. *Virginia*, Montgomery County, 20 August 1948, 1152 m, 1♂, H.K. Wallace, AMNH. *Virginia*, Norfolk County, 13 km south of Portsmouth in Dismal Swamp, 2 km south of Hwy 104 on Hwy 17, 18 September 1968, 1♀, 1♂, (no collector listed), MCZ.40043. *West Virginia*, Pocahontas County, Minnehaha Springs, 38 W 79, July 1947, 2♀, 2♂, W. Haller.

Agelenopsis oklahoma (Gertsch 1936)

Agelena oklahoma Gertsch 1936: 12, f. 4–5

Figs. 17, 18, 38, 53, 61A

Type specimens.—Male holotype, female allotype examined. *Oklahoma*, Payne County, Stillwater, C. Smith, 1934, AMNH.

Etymology.—Named for the state from which the species was described.

Diagnosis.—The male of this species can be separated from others in this genus by its loosely coiling embolus, making two full circles and slender, smooth, tapering tip (Figs. 17, 18). The female is distinctive in its very wide atrium, roughly four times as wide as high (Fig. 38).

Description.—General description as for the genus. Male ($n = 47$): overall length 6.90–12.86 mm; carapace width at its widest point 1.72–4.36 mm; carapace width at its narrowest point 0.98–2.29 mm. Shape of RTA is somewhat pointed; shape of median apophysis is sharp; conductor size is large with generally pointed shape; coiling of embolus is loose with an embolic tip termination angle of 720°; embolus subtriangular segment is absent; embolic tip orientation is recurved; embolic tip is slender and tapering; anneli on subtegulum are present (Figs. 17, 18). Female ($n = 45$): overall length 8.90–14.86 mm; carapace width at its widest point 2.45–3.83 mm; carapace width at its narrowest point 1.34–2.23 mm. Bursa is longer than wide, narrowly spaced from other distally but widely spaced at base, with tip angled slightly ventrally; fertilization duct makes two turns around base of bursa; spermatheca is tear-shaped, longitudinally positioned, and oriented dorsally of bursa; conducting tube directly enters anterior edge of spermatheca; diverticle is thick, curved, and tubular, larger than spermatheca, and nearly touching other; anterior atrial edge is slightly bilobed; epigynal bridge is thin and wide; bursa opening mostly visible (Figs. 38, 53).

Distribution.—CANADA: *Alberta*; USA: *Colorado*, Kansas, Minnesota, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, Utah, Wisconsin, Wyoming (Fig. 61A).

Material examined.—CANADA: *Alberta*, Medicine Hat, 14 August (no year given), 1♀, 1♂, J.M. Emerton, MCZ.39977. USA: *Colorado*, Delta County, Crawford, Crawford State Park, 4050 Highway 92, 38.71°N, 107.62°W, summer 2000, 1♂, K.L. Kontour, DMNS ZA.11282. *Colorado*, El Paso County, Cheyenne Mountain State Park campsite, 38.72°N, 104.83°W, 9–11 September 2005, 2♀, 3♂, pit traps in meadow, J. Slowik, DMNS ZA.10611. *Colorado*, El Paso County, Mt. Herman Rd. 329, 2 km west of Monument, CO, 39.22°N, 104.88°W, 7 September 2001, under a rock, 13:32 hr, 2104 m, 21° C, 1♂, B. Morrison, DMNS ZA.4785. *Colorado*, Garfield County, Glenwood Springs, 39°N, 107°W, July 1929, 2♂, E. Mayr, AMNH. *Colorado*, Larimer County, Fort Collins, 40°N, 105°W, 22 August 1946, under old post on ground near lake shore, Colledge Lake, 3♂, C.C. Hoff, AMNH. *Colorado*, Larimer County, Fort Collins, 1713 Richards Lake Rd., 40.62°N, 105.05°W, 29–30 August 1999, 1♀, 1♂, P.L. Wall, DMNS ZA.5510. *Colorado*, Larimer County, 1713 Richards Lake Rd., Ft. Collins, 40.46°N, 105.05°W, 9 September 1999, 1♂, P.L. Wall, DMNS ZA.4760. *Colorado*, Larimer, Fort Collins, 1713 Richards Lake Rd., 40.62°N, 105.05°W, 31 September 1999, 1♀, P.L. Wall. *Colorado*, Larimer County, Fort Collins, 1713 Richards Lake Rd., 40.62°N, 105.05°W, 12 December 1999, 1♀, P.L. Wall, DMNS ZA.4767. *Colorado*, Larimer County, 1713 Richards Lake Rd., Fort Collins, 40.62°N, 105.21°W, 2001 (no other collection date given), 1♂, P.L. Wall, DMNS ZA.5324. *Colorado*, Larimer County, 1713 Richards Lake Rd., Ft. Collins, 40.62°N, 105.21°W, 19 October 2001, basement shower, 1♂, P.L. Wall, DMNS ZA.5509. *Colorado*, Larimer County, Lon Hagler Reservoir, 40.37°N, 105.15°W, 26 August 1999, 13:00–14:00 hr, look-down, 1♂, N. Shilodon, DMNS ZA.4788. *Colorado*, Mesa County, Fruita, 127 N. Ash St., 39.16°N, 108.73°W, 20 August 2000, casual, 2♀, 1♂, T. Orr, DMNS ZA.8257. *Colorado*, Mesa County, Fruita, 127 N. Ash St., 39.61°N, 108.73°W, 24 August 2000, 1♂, casual, near kitchen, T. Orr, DMNS ZA.8258. *Colorado*, Mesa County, Fruita, 312 N Mesa St., 39.16°N, 108.73°W, 16 September 2002, 1♂, T. Bloomer, DMNS ZA.5022. *Colorado*, Pueblo County, Beulah Highway, Station 1, 30 August 1964, 1♂, no collector listed. *Colorado*, Teller County, Florissant Fossil Beds National Monument, 38.91°N, 105.29°W, 13 August 2002, 2621 m, lookdown, 1♀, 1♂, T. Schroeder & B. Crockett, DMNS ZA.4957. *Colorado*, Weld County, Pawnee National Grasslands, CPER, 11 August 1994, 1♀, 1♂, R.D. Weeks, Jr., USNM.D3. *Colorado*, Weld County, Pawnee National Grassland, off CR 63, 40.70°N, 104.47°W, 21 August 1999, 2♀, 2♂, M. & L. Siderhurst, DMNS ZA.9039. *Colorado*, Weld County, Pawnee National Grasslands, 40.45°N, 103.48°W, 1342 m, 07:00 hr, 16 August 2000, casual, 1♀, 1♂, T. Heister, DMNS ZA.8259. *Colorado*, Weld County, Bones Galore Paleo Site, 40.73°N, 103.80°W, 12 August 2001, look down, 4.5 hour cum, 16:00–20:30 hr, 1434 m, 1♀, T. Heister, DMNS ZA.9332. *Colorado*, Weld County, Bones Galore Paleo Site, 13–22 August 2000, 1♀, S. & A. Alvarez, DMNS ZA.11838. *Colorado*, Weld County, Bones Galore Paleo Site, 40.73°N, 103.80, 16 August 2001, 1433 m, 17:00–22:00 hr; lookdown, area wetter than last year, 1♂, T. Heister, DMNS ZA.8260. *Colorado*, Weld County, Erie, 1291 Co Rd 11, 40.02°N, 104.96°W, 1♂, J. Goltl, DMNS ZA.9330. *Kansas*, Calista

County, Kingman Lake Park, 13 October 1963, 1♀, 37.39°N, 98.15°W, J. & W. Ivie, AMNH. *Kansas*, Douglas County, Lawrence, 17 September 1988, at night, wandering on side of trailer, 1♂, H. Guarisco, AMNH. *Kansas*, Russell County, 38.88°N, 98.88°W, 23 August 1935, 3♀, 4♂, W. Ivie, AMNH. *Minnesota*, Rock County, Luverne, 13–14 September 1935, 1♀, 1♂, 43°N, 96°W, Telford (no first initial), AMNH. *Montana*, Gallatin County, Three Forks, 17 August 1941, 2♀, 1♂, 45.87°N, 111.52°W, D. & S. Mulaik, AMNH. *Nebraska*, Sioux County, Oglala National Grasslands, Sugarloaf, 1–12 August 2004, 1♂, shed, H. Guarisco, DMNS ZA.12001. *North Dakota*, Pennington County, 8 km S of Rapid City, 19 September 1950, 1♂, 44°N, 103°W, V. Roth, AMNH. *Oklahoma*, Cleveland County, 15 September–15 November, 1♀, no other collection data given, J. Ward, MCZ.39979. *Oklahoma*, Comanche County, Fort Sill, Quanah, 5 km W of Falcon Gate, 2 October 2004, 1♀, 34.64°N, 98.75°W, 2179 km, 16:20–17:50 hr, look down, P.E. Cushing, DMNS ZA.7366. *Oklahoma*, Payne County, Stillwater, 1934 (no other collection date given), 1♀, 1♂, C. Smith, AMNH. *South Dakota*, Custer County, Beaver Creek Spring, 5 km E of Pringle, 7 August 1954, 1♂, H. & L. Levi, MCZ.39983. *South Dakota*, Kingsbury County, Lake Preston area (formerly Iroquois State Park), 18 September 1950, 10♀, 44°N, 97°W, V. Roth, AMNH. *Utah*, Duchesne County, 40.17°N, 110.4°W, 25 August 1935, 3 vials containing in total 9♀, 3♂, W. Ivie, AMNH. *Utah*, Roosevelt County, 25 August 1935, 1♀, 2♂, 40°N, 110°W, in grass by marsh, W. Ivie, AMNH. *Wisconsin*, Crawford County, Prairie du Chien, October 1950, 197 m, 1♂, M. Melanie, MCZ.39984. *Wyoming*, [Glamos], 24 August 1961, 1♀, R. Lourgue, AMNH.

Agelenopsis oregonensis (Chamberlin & Ivie 1935)

Agelenopsis oregonensis Chamberlin & Ivie 1935: 32,
pl. 14, f.108.

Figs. 11, 12, 37, 52, 61B

Type specimens.—Male holotype examined: *Oregon*, Multnomah County, Latourell Falls, Columbia River, 45.55°N, 122.2° W, 4 August, 1929, AMNH. 1♀, 1♂ paratype examined: *Oregon*, Forest Grove County 45°N, 123° W, 6 August 1929, R.V. Chamberlin, AMNH. One female paratype from *Oregon*, Hood River County, Hood River, 4 August, 1929, R.V. Chamberlin, AMNH.

Etymology.—Named for the state from which the species was described.

Diagnosis.—The male of this species is easily distinguished from others in the genus by its slightly tight, then loosely coiling, embolus, making more than one full circle, with a slightly procurved, twisting, and somewhat tapered tip (Figs. 11, 12). The female is distinctive in its spermatheca and diverticle being of equal size, both bulbous, and clearly visible from the ventral side (Fig. 52).

Description.—General description as for the genus. Male ($n = 34$): overall length 7.45–9.65 mm; carapace width at its widest point 2.60–3.32 mm; carapace width at its narrowest point 1.44–1.79 mm. Shape of RTA is nipple-like; shape of median apophysis is somewhat pointed; conductor size is large with generally pointed shape; coiling of embolus is slightly tight, then loose with an embolic tip termination angle of 540°; embolus subtriangular segment is absent; embolic tip orienta-

tion is not recurved; embolic tip is slender and tapering; anneli on subtegulum are present (Figs. 11, 12). Female ($n = 38$): overall length 7.95–11.55 mm; carapace width at its widest point 1.70–3.87 mm; carapace width at its narrowest point 0.99–1.89 mm. Bursa is longer than wide, touching other bursa distally but widely spaced at base, oriented vertically with tip angled slightly dorsally; fertilization duct wraps two times around base of bursa; ventral side spermatheca is a longitudinally positioned, tube-shaped structure with conducting tube entering laterally (there is almost no distinction between conducting tube and spermatheca on dorsal side); spermatheca sits in between bursae; diverticle is bulbous and about the same size as spermatheca, with distance between it and other being more than half the diameter of diverticle; anterior atrial edge is distinctly bilobed; epigynal bridge shape is thick and short; bursa opening is mostly visible (Figs. 37, 52).

Distribution.—CANADA: *Alberta, British Columbia*; USA: *California, Oregon, Washington* (Fig. 61B).

Material examined.—CANADA: *Alberta*, July 1927, no other collection information provided, 1♀, O. Bryant, USNM.2031393. *British Columbia*, Wellington, Vancouver Island, 20–24 August 1950, 49°N, 123°W, 2♀, R. Guppy, AMNH. *British Columbia*, Vancouver Island, DND Rocky Point, 22 August 1994, malaise trap, garry oak, forest floor, 1♂, N. Winchester, DMNS ZA.31364. *British Columbia*, Vancouver Island, DND Rocky Point, 24 August 1994, garry oak, malaise trap, open meadow, 1♂, N. Winchester, DMNS ZA.31360. *British Columbia*, Vancouver Island, DND Rocky Point, 26 September 1994, 1♂, N. Winchester, garry oak, open meadow, malaise trap, D. Buckle, DMNS ZA.31362. *British Columbia*, Vancouver Island, DND Rocky Point, 31 July 1995, malaise trap, garry oak, forest floor, 1♀, 2♂, N. Winchester, DMNS ZA.31361. *British Columbia*, Vancouver Island, DND Rocky Point, 26 August 1995, malaise trap, garry oak, open meadow, 1♂, N. Winchester, DMNS ZA.31363. *British Columbia*, Vancouver Island, DND Rocky Point, 26 August 1995, malaise trap, garry oak, forest floor, N. Winchester, 5♂, DMNS ZA.31359. *British Columbia*, Vancouver Island, DND Rocky Point, 4 October 1995, malaise trap, garry, oak forest floor, 1♀, 7♂, N. Winchester, DMNS ZA.31410. USA: *California*, Humboldt County, 8 km SW Orleans, 41°N, 123°W, 22 August 1959, 1♀, W.J. Gertsch & V. Roth, AMNH. *California*, Humboldt County, 3 km N of Phillipsville, 40°N, 123°W, 14 September 1961, 5♀, W.J. Gertsch & W. Ivie, AMNH. *California*, Humboldt County, 29 km west of Willow Creek, 41°N, 123°W, 21 August 1959, 1♀, W.J. Gertsch & V. Roth, AMNH. *California*, Humboldt County, 32 km west Willow Creek, 20 July 1962, 1♀, V. Roth, AMNH. *Oregon*, Jackson County, Ashland, Lithia Park, 42°N, 122°W, 1♀, W.J. Gertsch & V. Roth, 31 August 1959. *Oregon*, Jackson County, Union Creek, 42°N, 122°W, 1006 km, 1–15 September 1950, 3♀, B. Malkin, AMNH. *Oregon*, Yamhill County, Corvallis, MacDonald Forest, 44°N, 123°W, 30 September 1950, 1♀, V. Roth, AMNH. *Washington*, Chelan County, Peavine Creek, 47.86°N, 120.95°W, 22 June 1985, 671 m, web on ground, 1♂, R. Crawford, BMNHC. *Washington*, Clallam County, Olympic National Forest, Mt. Angele, September 1927, 1♂, E. Prye, MCZ.39970. *Washington*, Clallam County, lower Elwha River, Olympic National

Park, 15 July 1951, 1♂, H. & L. Levi, MCZ.39980. *Washington*, King County, Seattle, 6–9 August 1935, sweeping vegetation, 1♀, 1♂, E. Sanders, MCZ.39975. *Washington*, King County, Seattle, University of Washington Campus, 47.66°N, 122.31°W, 13 October 1972, in outside stairwell, 61 m, 1♂, R. Crawford, BMNHC. *Washington*, King County, Seattle, University of Washington Campus, 47.66°N, 122.31°W, 5 September 1976, in outside stairwell, 61 m, 1♂, R. Crawford, BMNHC. *Washington*, King County, Seattle, University of Washington, 47.66°N, 122.31°W, 2 October 1993, 61 m, on outside wall of museum building, 1♂, R. Crawford, BMNHC. *Washington*, King County, N 47.75°N, 122.18°W, 3 September 1966, Bothell, 3♂, J.R. Thomson, USNM.2031393. *Washington*, Kittitas County, Kachess Lake, 47.28°N, 121.22°W, 19 August 1973, marsh near lake, 719 m, on web in low shrub, 1♂, R. Crawford, BMNHC. *Washington*, Lewis County, Ike Kinswa State Park, 46.56°N, 122.53°W, 25 June 1988, 201 m, webs on ground edge wood, 1♀, 1♂, R. Crawford, BMNHC. *Washington*, Olympia County, 47°N, 122°W, 4 August 1929, 2♀, 1♂, H. Exline, AMNH. *Washington*, Olympia County, no collection date provided, 8♀, Nathan Banks Collection, no other info, N. Banks, MCZ.39969. *Washington*, Pierce County, Bonney Lake, 47.19°N, 122.18°W, 6 September 1994, 300 m northeast of lake, 195 m, web in shrub in yard, 1♂, T. Gerding, BMNHC. *Washington*, San Juan County, Friday Harbor, N 48.52–56 W 123.00–04, 5 August 1934, 0–147 m, 1♂, H. Exline, BMNHC. *Washington*, Thurston County, Baker Prairie, 46.84°N, 123.08°W, (no date), 46 m, from web in tree on grassy prairie, 1♂, J. Miller, BMNHC. *Washington*, Whitman County, September (no collection year provided), 4♀, Pullman, W.M. Mann, MCZ.39971.

Agelenopsis pennsylvanica (C.L. Koch 1843)

Agelena pennsylvanica Koch 1843: 111, f. 20–21.

Figs. 3, 4, 30, 45, 61C

Type specimen.—Holotype not examined. Type locality: Pennsylvania, Klug.

Etymology.—Named for state from which the species was described.

Diagnosis.—The male of this species is distinguished from other species in this genus by its tightly coiling embolus, making a full circle with pointed tip positioned perpendicular to cymbium (Figs. 3, 4). The female is distinctive in its skull-shaped bursa, very smooth, rounded atrial opening with spermathecae tending to nestle one above the other rather than positioned side by side (Fig. 45).

Description.—General description as for the genus. Male ($n = 26$): overall length 7.64–12.82 mm; carapace width at its widest point 2.55–4.50 mm; carapace width at its narrowest point 1.54–2.25 mm. Shape of RTA is nipple-like; shape of median apophysis is thick and somewhat pointed; conductor size is large and claw-like; coiling of embolus is tight with an embolic tip termination angle of 470°; embolus subtriangular segment is present; embolic tip orientation is not recurved; embolic tip is slender and tapering; anneli on subtegulum are present (Figs. 3, 4). Female ($n = 27$): overall length 9.35–14.00 mm; carapace width at its widest point 2.38–4.88 mm; carapace width at its narrowest point 1.32–2.65 mm. Bursa is very rounded, skull-like in profile, converges toward other but does not touch it, and angles ventrally; two turns of

fertilization ducts; spermatheca is kidney shaped, nestled slightly above other, oriented longitudinally, and positioned dorsally of bursa; conducting tube enters spermatheca on front side directly and ventrally; seem to be two parallel conducting tubes; diverticle is curved and tubular, larger than the spermatheca, and less than half a diverticle's distance from the other; anterior atrial edge is smooth; epigynal bridge shape is thin and wide; bursa opening is mostly visible (Figs. 30, 45).

Distribution.—USA: *Colorado, Connecticut, Idaho, Illinois, Kansas, Louisiana, Massachusetts, Michigan, North Dakota, Ohio, Oregon, Pennsylvania, Tennessee, Utah, West Virginia* (Fig. 61C).

Material examined.—USA: *Colorado*, Adams County, Northglenn, 10565 Kalamath, 39.89°N, 105.00°W, 1661 m, 6 October 1999, 1♀, D.M. Ennis, DMNS ZA.13362. *Colorado*, Adams County, Thornton, 12225 Clermont St., 39.92°N, 104.93°W, 15 August 1999, look up, 21:30–21:40 hr, in flower garden by side of garage, 1♂, P.M. Reed, DMNS ZA.4979. *Colorado*, Adams County, Thornton, 12225 Clermont St., 39.92°N, 104.93°W, 26 August 1999, 18:30–18:40 hr, look up, inside of garage by the flower garden, 1♂, P.M. Reed, DMNS ZA.11286. *Colorado*, Arapahoe County, Aurora, 835 Memphis St., 39.73°N, 104.86°W, 6 October 1999, 1♀, C.P. McAdams, DMNS ZA.13353. *Colorado*, Boulder County, Longmont, Bowron Place, 40.08°N, 105.19°W, 10 September 2001, 1♂, M. Dolieslager, DMNS ZA.11381. *Colorado*, Denver County, Bluff Lake Park off Moline, 39.76°N, 104.86°W, 13 August 2005, 1♀, S. Hink, DMNS ZA.13354. *Colorado*, Denver County, Denver, 1780 Quebec St., 39.74°N, 104.90°W, 27 August 2000, 1♂, C.E. Ransom, DMNS ZA.4793. *Colorado*, Denver County, Denver, 1570 Dahlia St., 39.69°N, 104.93°W, 29 September 2001, 1♀, S. Alvarez, DMNS ZA.13347. *Colorado*, Denver County, Denver, 5121 East Asbury Ave., 39.73°N, 104.80°W, 5 October 2003, 1♀, G.S. Weeding, DMNS ZA.6260. *Colorado*, Jefferson County, Lakewood, 8665 W 13th Ave., 39.74°N, 105.93°W, 1 October 2001, in house, 1♂ R. Johnson, DMNS ZA.8806. *Colorado*, Jefferson, Lakewood, 1320 Dudley, 39.74°N, 105.09°W, Jefferson, 26 August 2003, in bathtub, 0600 hr, 1♂, J. Oliva-Purdy, DMNS ZA.8805. *Colorado*, Jefferson County, Lakewood, 1320 Dudley, 39.74°N, 105.09°W, 11 September 2003, on towel in birdcage 08:30 hr, 1♂, J. Oliva-Purdy, DMNS ZA.6356. *Colorado*, Jefferson County, Lakewood, Jefferson County Open School, 7655 W 10th Ave., 80215, 39.73°N, 105.08, 14 September 1999, 1♂, A. Weis, DMNS ZA.6670. *Colorado*, Jefferson County, Lakewood, Jefferson County Open School, 7655 W. 10th Ave., 39.73°N, 105.09°W, 3 September 2003, 13:30–14:30 hr, 1♂, B. Bartlett, DMNS ZA.6675. *Colorado*, Jefferson County, Lakewood, Jefferson County Open School, 7655 W 10th Ave., 39.73°N, 105.09°W, 18 September 2003, 1♂, [Judith Miller student], DMNS ZA.6667. *Colorado*, Jefferson County, Lakewood, Jefferson County Open School, 7655 W 10th Ave., 39.73°N, 105.09°W, 9 October 2003, 1♂, H. Grant, DMNS ZA.6661. *Colorado*, Jefferson County, Littleton, 5374 S. Datura, 39.62°N, 105.00°W, October 2003, 1♂, A. Williams, DMNS ZA.6563. *Colorado*, Weld, Erie, 1291 Colorado Rd. 11., 40.02°N, 104.96°W, J. Goltl, DMNS ZA.8779. *Colorado*, Weld County, 13 Pierce, 42714 Weld Co Rd. 37, 40.62°N, 104.72°W, October 1999, 1♀, 1♂, Furman family, DMNS ZA.8753. *Colorado*,

Yuma County, Bonny State Park, 39.60°N, 102.22°W, 55 R 43 W section, 3 October 2003, 1124 m, school class, 1♀, J.M. Smith, DMNS ZA.13475. *Colorado*, Yuma County, Bonny State Park, 39.60°N, 102.22°W, 4 October 2003, 1123 m, 55 R 43 W section, school class, 1♀, J.M. Smith, DMNS ZA.13475. *Connecticut*, New Haven County, West Rock Park, 19 September 1964, 1♀, B. & C. Durden, DMNS ZA.140. *Idaho*, Nez Perce County, Lewiston, 46°N, 116°W, 21 October 1936, 2♀, W. Ivie, AMNH. *Idaho*, Payette County, NE Fruitland Spring, 44°N, 116°W, 1937, 1♀, W. Ivie. *Idaho*, Payette County, NE Fruitland Spring, 44°N, 116°W, spring 1942, 1♀, E.M. Ivie, AMNH. *Idaho*, Payette County, NE Fruitland, 44°N, 116°W, fall 1942, 4♀, 1♂, E.M. Ivie, AMNH. *Kansas*, Johnson County, Roeland Park, 25–27 August 1961, 1♂, A.R. Brady, MCZ.40169. *Massachusetts*, Chatham County, Barnstable, 6 September 1976, 1♀, J. Coddington, MCZ.40039. *Massachusetts*, Franklin County, Rowe, 20 August 1965, 2♂, B. Durden et al., DMNS ZA.1891. *Michigan*, Calhoun County, Albion, 12 August 1932, 2♀, 1♂, A.M. Chiekering, MCZ.40044. *Michigan*, Calhoun County, Albion, fall 1959, 1♀, 1♂, no collector listed, MCZ.40041. *Oregon*, Yamhill County, McMinnville, 45°N, 123°W, October 1948, 2♀, K.M. Fender, AMNH. *Pennsylvania*, Allegheny County, 24 August 1933, PGH, no other collection information provided, AMNH. *Pennsylvania*, Cambria County, Johnstown, 20 August 1935, 1♂, (no collector listed). *Pennsylvania*, Westmoreland County, 24 August 1935, 1♀, H.K. Wallace, FSCA.456. *Pennsylvania*, York County, Shrewsbury, 1979, 1♀, 1♂, L. Perry, MCZ.40038. *Utah*, Utah County, Canyon Glen in Provo Canyon, September 1942, 1♂, no collector listed, AMNH. *Virginia*, Augusta County, Staunton, 27 August 1970, 1♂, M. Hoffman, MCZ.40166. *Washington*, Walla Walla County, October 1926, 1♀, on porch, no other location information, MCZ.40168. *Washington*, Whitman County, Pullman, September, no day or year listed, W.M. Mann, MCZ.39971.

Agelenopsis potteri (Blackwall 1846)

Agelena potteri Blackwell 1846: 43.

Figs. 5, 6, 31, 46, 61C

Type specimen.—Holotype presumed missing. Type locality: Montreal, Quebec according to Chamberlin & Ivie (1941).

Etymology.—Named for John Blackwall's friend Richard Potter, Esq., M.A., of Queens College, Cambridge, and Professor of Natural Philosophy in University College, London.

Diagnosis.—The male of this species is distinctive in having a tightly coiled embolus, making more than a full circle, with a strongly recurved hooked tip (Figs. 5, 6). The female is distinctive in its bursa folding back ventrally on itself with only its base visible when viewed from the dorsal side and in having a bilobed anterior epigynal edge rather than a smooth one (Figs. 31, 46).

Description.—General description as for the genus. Male ($n = 25$): overall length 7.06–11.26 mm; carapace width at its widest point 2.30–4.36 mm; carapace width at its narrowest point 1.37–2.13 mm. Shape of RTA is pointed; shape of median apophysis is thick and somewhat pointed; conductor size is large and claw-like; coiling of embolus is tight with an embolic tip termination angle of 470°; embolus subtriangular

segment is absent; embolic tip orientation is recurved; embolic tip is hooked; anneli on subtegulum are present (Figs. 5, 6). Female ($n = 25$): overall length 5.75–12.22 mm; carapace width at its widest point 1.96–3.91 mm; carapace width at its narrowest point 1.12–2.11 mm. Bursa is folded back ventrally on itself, giving the appearance of being rounded but is in fact longer than wide, converging in middle ventrally and touching other; two turns of fertilization duct; spermatheca is tear-drop shaped, touches other, and is oriented longitudinally between bursae; conducting tube diverges from other but enters spermathecae directly and anteriorly; diverticle is curved, thick, and tubular, larger than the spermatheca, and almost touches other; anterior epigynal edge is generally smooth but can be minimally rippled or very slightly bilobed; epigynal bridge is thin and wide; bursa opening is mostly visible (Figs. 31, 46).

Distribution.—CANADA: *Ontario, Saskatchewan*; USA: *Colorado, Indiana, Iowa, Maine, Massachusetts, Michigan, Minnesota, Montana, Nebraska, North Dakota, Washington, Wisconsin, Wyoming* (Fig. 61C).

Material examined.—CANADA: *British Columbia*, Grand Forks, 1 September 1965, 1♂, J. & W. Ivie, AMNH. *Ontario*, Toronto, Swansea, July 1937, 1♂, H.S. Parish, MCZ.40178. USA: *Colorado*, Adams County, Aurora, 895 Oswego St., 39.73°N, 104.85°W, no collection date listed, 1♀, A. Tucker, DMNS ZA.4982. *Colorado*, Adams County, Northglenn, 10565 Kalamath, 39.89°N, 105.00°W, 12 October 1999, 1661 m, 1 min. looking level, 1♀, D.M. Ennis, DMNS ZA.4794. *Colorado*, Jefferson County, Golden, 835 Urban St., 39.73°N, 105.13°W, 12 September 1999, 20:30–21:30 hr lookdown, 1♀, S. Snover, DMNS ZA.6663. *Colorado*, Jefferson County, Lakewood, 6298 W. 26th Ave., 9 November 1999, 39.75°N, 105.07°W, 1♀, D. Lynch, DMNS ZA.4852. *Colorado*, Jefferson County, Lakewood, Jefferson County Open School, 7655 W. 10th Ave., 39.73°N, 105.08°W, 23 September 1999, 1♀, H. Tran, DMNS ZA.4959. *Colorado*, Jefferson County, Lakewood, Jefferson County Open School, 7655 W 10th Ave., 39.73°N, 105.08°W, 29 September 1999, 1♀, J.L. Kiefert, DMNS ZA.8155. *Colorado*, Jefferson County, Littleton, Chatfield State Park, off C470 & Highway 121, 39.52°N, 105.07°W, 18 August 2001, under bark, 13:58–15:30 hr, 1599 m, 33 °C, 1♀, 2♂, B. Morrison, DMNS ZA.6673. *Colorado*, Jefferson County, Chatfield State Park, Audubon Center Building, 10 September 2004, 39.49°N, 105.09°W, 1689 m, short grass, 2♀, H. Guarisco, DMNS ZA.8641. *Colorado*, Jefferson County, Littleton, W. Chatfield State Park, Highway 121 & C470, 39.52°N, 105.08°W, 13 September 2004, 14.55 hr, 1713 m, in its web, plains, marsh near gravel pond, 1♀, B. Morrison, DMNS ZA.8157. *Colorado*, Jefferson County, Littleton, Chatfield State Park, Highway 121 & C 470, 39.52°N, 105.08°W, 13 September 2004, 1713 m, 14:50 hr, lookdown, under bark near gravel pond, 1♂, B. Morrison, DMNS ZA.8163. *Colorado*, Montezuma County, Mesa Verde National Park, 18 July 2001, casual, piñon and juniper, under rocks and logs, webs in trees, 1♀, A.R. Nabors, DMNS ZA.4768. *Indiana*, Adams County, Decatur, 15 September 1969, on house, 1♀, M. Davis, MCZ.40179. *Iowa*, Cerro Gordo County, Clear Lake, 16 August 1956, 1♀, 3♂, H. & L. Levi, MCZ.40172. *Iowa*, Winnebago County, 22 August 1933, 1♂, I. V. Cantrell, AMNH. *Maine*, Cumberland County, Portland,

no collection date provided, 1♀, 1♂, no collector listed, MCZ.40181. *Maine*, Waldoboro County, no collection date listed, E. Lloyd, MCZ.40174. *Massachusetts*, Middlesex County, Pepperell, September 1978, 2♀, 2♂, H., L. & F. Levi, MCZ.40171. *Massachusetts*, Norfolk County, Milton, 28 August–6 September 1956, 2♀, 6♂, H. & L. Levi, MCZ.40175. *Michigan*, Chippewa County, Sault Ste Marie, Sherman Park, 2 September 1980, 2♂, A. Matelski, NMSU. *Minnesota*, Beltrami County, NE Lake Bemidji, 47.52°N, 94.82°W, 10 September 2004, 46 m, in house shingles, 21:00–21:30 hr, lookdown, 3♂, M. Francis, DMNS ZA.6963. *Minnesota*, Ramsey County, St. Paul, University of Minnesota campus, 16 September 1970, in manure pile, 1♀, J. Milne, AMNH. *Nebraska*, Buffalo County, Amherst, October 1971, 1♀, L. Alexander, MCZ.40180. *North Dakota*, Cass County, Fargo, 46.85°N, 96.80°W, no collection date listed, 2♀, W. Ivie, AMNH. *North Dakota*, Cass County, Fargo, 23 August 1965, 1♂, J. Donat, MCZ.40177. *Washington*, Glacier County, Mount Baker, 48.53°N, 121.57°W, 7 September 1965, 1♀, W. & J. Ivie, AMNH. *Wisconsin*, Rock County, Edgerton, 817 County Highway M, 42.79°N, 89.02°W, 24 September 2005, 250 m, house at farm, 1♀, K.M. Potter, DMNS ZA.31941.

Agelenopsis spatula Chamberlin & Ivie 1935

Agelenopsis spatula Chamberlin & Ivie 1935: 32, pl. 14, f. 109. Figs. 13, 14, 35, 50, 61D

Type specimens.—Male holotype, female allotype, examined; female paratype not examined. *Texas*, Wichita Falls, 33.88° N, 98.45°W, 3 September 1933. W. Ivie, AMNH.

Etymology.—Named for the male's spatulate embolic tip.

Diagnosis.—The male of this species is distinctive in having a somewhat tight coiling of the embolus with a spatulate embolic tip (Figs. 13, 14). The female *A. spatula* is unique in having a thickened diverticle and is one of only two species that has an atrial opening with a monolobed anterior edge (Figs. 35, 50).

Description.—General description as for the genus. Male ($n = 11$): overall length 8.45–13.24 mm; carapace width at its widest point 2.96–4.53 mm; carapace width at its narrowest point 1.48–2.30 mm. Shape of RTA is nipple-like; shape of median apophysis is thick and somewhat pointed; conductor size is large and pointed; coiling of embolus is tight with an embolic tip termination angle of 470°; embolus subtriangular segment is present; embolic tip orientation is not recurved; embolic tip is hooked; anneli on subtegulum are present (Figs. 13, 14). Female ($n = 18$): overall length 7.87–15.49 mm; carapace width at its widest point 2.80–3.84 mm; carapace width at its narrowest point 1.68–2.08 mm. Bursa is longer than wide and somewhat twisted and converging toward other one ventrally; bursae tips are oriented ventrally but not touching; fertilization ducts wind twice around base of bursa; spermatheca is kidney shaped, touching at posterior (ventral) end but diverging radically, positioned longitudinally, sitting generally centrally between bursa; conducting tube enters at front edge so conducting tube angles laterally/diverging ectally; diverticle is curved and tubular, larger than spermatheca, and not touching the other; anterior atrial edge is monolobed; epigynal bridge shape is thin and wide; bursa opening is mostly visible (Figs. 35, 50).

Distribution.—USA: *Colorado, Kansas, New Mexico, Texas* (Fig. 61D).

Material examined.—USA: *Colorado*, El Paso County, Cheyenne Mountain State Park, lower gate, 38.72°N, 104.82°W, 1886 m, 1♀, J. Slowik, DMNS ZA.10630. *Kansas*, Meade County, Cimarron River, 37.02°N, 100.28°W, 13 August 1964, 1♀, H.S. Fitch, AMNH. *New Mexico*, Quay County, South Tucumcari, 14 August 1990, collected in house, 1♂, S. Moore, NSMU. *New Mexico*, Santa Fe County, 6 km west of Pojoaque, 18 August 1973, 1♂, B. Vogel, DMNS ZA.153. *Texas*, Archer County, Lake Kickapoo, 6 km southeast of Blackflat, 33°N, 98°W, 29 October 1964, 3♀, 1♂, K.W. Haller, AMNH. *Texas*, Clay County, 10 October 2006, collected in rocks near water, 1♂, C. Churchill, MWSU. *Texas*, Dallam County, 2 km east of the Texas line near Colorado border near railroad track, 1452 m, off Hwy 87, 36.39°N, 103.04°W, 2♀, P.E. Cushing, DMNS ZA.7365. *Texas*, Erath County, Stephenville, 7 October 1983, from peanuts, 1♂, C.W. Agnew, TXAM.582. *Texas*, Erath County, 11 km northeast of Stephenville, 17 May 1983, 1♂, C.W. Agnew, TXAM. *Texas*, Frio County, Pearsall, 18 October 1939, 1♂, C.E. Heard, AMNH. *Texas*, Houston County, 3 km southwest of center of Kennard, 22–31 May 2001, 1♀, 31.33°N, 95.22°W, pine 88.1%, pitfall original plot 38, J. Yantis, TXAM.02. *Texas*, Roberts County, 16 September 1972, rocks, 1♀, T. Kaspar, MWSU. *Texas*, Travis County, Austin, 5 October 1968, 1♂, B. Vogel, DMNS ZA.1899. *Texas*, Wichita County, 6 km southwest of Burkburwett, 25 October 1975, web in rocks cross tanks, 1♀, J. Cokendolpher, MWSU. *Texas*, Wichita County, 8 November 1980, on ground, 1♀, F. Stangel, MWSU. *Texas*, Wichita County, 8 February 1995, on ground, 1♀, D. Reddick, MWSU. *Texas*, Wichita County, 27 February 1995, under rock, 1♀, D. Reddick, MWSU. *Texas*, Wichita County, 30 September 2001, pitfall, 1♂, C.J. Bowen, Jr., MWSU. *Texas*, Wichita County, 23 October 2001, pitfall, 1♂, C.J. Bowen, Jr., MWSU. *Texas*, Wichita County, 30 October 2001, pitfall, 1♀, C.J. Bowen, Jr., MWSU. *Texas*, Williamson County, Florence, 3 km east of N. Salado Creek, 23 October 1971, 1♀, B. Vogel, DMNS ZA.13479. *Texas*, Williamson County, 4 km northwest of Jarrell, 23 October 1971, 3♀, B. Vogel, DMNS ZA.156.

Agelenopsis utahana (Chamberlin & Ivie 1933)

Agelena utahana Chamberlin & Ivie 1933: 43, pl. 11, f. 113–115.

Figs. 9, 10, 36, 51, 61B

Type specimens.—Male holotype and female allotype examined. *Utah*, Box Elder County, Raft River Mountains, Clear Creek, 4 September 1932, 41.95°N, 113.17°W, Ivie, AMNH 1♂, 4♀ paratypes examined: *Utah*, Utah County, Aspen Grove, 40°N, 111°W, August 1926, Harris & Tanner, AMNH. 1♂, 3♀ paratypes examined: *Utah*, Utah County, 32°E, 40°N, 111°W, 675 ft (205.7 m), AMNH.

Etymology.—Named for state from which the species was described.

Diagnosis.—The male of this species is distinctive for its very tightly coiled embolus with slender, procurved tip (Figs. 9, 10). The female of this species is distinctive for being only one of two species in this genus with a thick and short epigynal bridge shape, along with *A. naevia* (Fig. 36).

Description.—General description as for the genus. Male ($n = 25$): overall length 6.42–9.04 mm; carapace width at its

widest point 2.35–3.26 mm; carapace width at its narrowest point 1.25–1.80 mm. Shape of RTA is nipple-like; shape of median apophysis is blunt; conductor size is large and truncate; coiling of embolus is tight with an embolic tip termination angle of 470°; embolus subtriangular segment is absent; embolic tip orientation is not recurved; embolic tip is slender and tapering; anneli on subtegulum are present (Figs. 9, 10). Female ($n = 25$): overall length 6.10–10.92 mm; carapace width at its widest point 1.99–3.32 mm; carapace width at its narrowest point 1.07–1.95 mm. Bursa is longer than wide, widely spaced from the other, and angled slightly ventrally from vertical; fertilization ducts coil twice around the base of the bursa, spermatheca is more knob-like at distal end of connecting tube than rounded itself and is oriented transversely, positioned prominently on the ventral side; conducting tubes seem to be looping around entrance to spermathecae, entering anteriorly; diverticle is small, bulbous (about same size as spermatheca), heavily sclerotized, rounded, and widely set from other; anterior edge of atrium is distinctly bilobed; epigynal bridge is thick and short; copulatory duct opening is mostly visible (Figs. 36, 51).

Distribution.—CANADA: *Alberta*, *British Columbia*, *Manitoba*, *Saskatchewan*; USA: *Alaska*, *Colorado*, *Massachusetts*, *Michigan*, *Montana*, *New Hampshire*, *New York*, *Ohio*, *Pennsylvania*, *Utah*, *Virginia*, *Wyoming* (Fig. 61B).

Material examined.—CANADA: *Alberta*, 29 July 1949, 1♀, [Conklin], AMNH. USA: *Alaska*, North Star Borough, Southeast Fairbanks, 3 July 2000, 1♀, 1♂, F. Levi, MCZ.21927. *Colorado*, Denver County, Denver, 535 Dahlia, 39.72°N, 104.93°W, 11 August 2003, 2♂, J.I. Gilman, DMNS ZA.8449. *Colorado*, Gilpin County, Golden Gate Canyon State Park, Bootleggers Bottom Trail, 39.86°N, 105.45°W, 3 August 2001, 2717 m, 15:00–16:00 hr, sweep/look down, creek bed ravine, 1♀, K. Egerman, DMNS ZA.8263. *Colorado*, Jefferson County, Golden Gate Canyon State Park, Ranch Ponds, 39.85°N, 105.37°W, 11 August 2002, 2377 m, 12:40–14:00 hr, lookdown, 1♂, P.E. Cushing, DMNS ZA.11461. *Colorado*, Jefferson County, Elk Meadow Open Space Park, Stagecoach Blvd., 13:00–15:00 hr, 1♀, K. P. Owens, DMNS ZA.8261. *Colorado*, Larimer County, Drake, Roosevelt National Forest on Waltonia River, 40.41°N, 105.36°W, in cabin shed, 8 July 2001, 1♀, M. Spoon, DMNS ZA.6665. *Colorado*, Las Animas County, Bar NI Ranch, 37.16°N, 105.37°W, 14 July 2001, during Bioblitz, 2984 m, lookdown, 1♂, D.W. James, DMNS ZA.11919. *Colorado*, Montezuma County, Mesa Verde National Park, campground, 37.30°N, 108.42°W, 14–16 August 2005, 2316 m, casual camp spiders, 2♂, P.E. Cushing, J.T. Stephenson, T. Heister, J. Slowik, DMNS ZA.11387. *Maine*, Piscataquis County, 1.9 km south-southeast of Soubunge Mountain., Line I, Tn. 2 T4 R11, 28 July 1977, WELS spruce-fir forest; stripcut, pitfall, 1♂, M.W. Houseweart & D.T. Jennings, AMNH. *Michigan*, Livingston County, ES George Reserve, grid P-18, 24 June 1951, 1♂, H.E. Wallace, AMNH, vial #1421. *Montana*, Carbon County, East Rosebud Lake, 45°N, 109°W, 1890 m, 6 July 1966, 1♂, B. Vogel, DMNS ZA.144. *Montana*, Carbon County, E. Rosebud Lake, 14 August 1967, 1890 m, B. & C. Durden, DMNS ZA.148. *Montana*, Carbon County, Rosebud Canyon, 17 August 1967, 1920 m, 1♂, B. & C. Durden, DMNS ZA.151. *Montana*, Carbon County, E. Rosebud Lake, 25 August 1977,

1890 m, 1♀, 1♂, B. & M. Vogel, DMNS ZA.13482. *Montana*, Flathead County, Bigfork, 23–24 August 1957, 914 m, field w. stones & logs, 2♀, 2♂, H. & L. Levi, MCZ.40025. *New Hampshire*, Carroll County, Moultonboro, Kona Bay, 9 August 1980, woods, 3♀, 2♂, H. & L. Levi, MCZ.40021. *New Hampshire*, Grafton County, Franconia, 44.22°N, 71.73°W, no collection date listed, no collector listed, 1♀, 1♂, AMNH. *New York*, Sullivan County, Beaver Kill, 41°N, 74°W, 30 August 1944, 1♂, R.B. Fisher, AMNH. *New York*, Ulster County, Chichester, 42°N, 74°W, 3 August 1945, 2♂, T. Cohn, AMNH. *New York*, Ulster County, Chichester, 42°N, 74°W, 8–21 August 1945, 1♀, 1♂, T. Cohn, AMNH. *Ohio*, Franklin County, Columbus, 28 September 1950, 1♀, H.V. Weems, Jr., FSCA. *Pennsylvania*, Westmoreland County, 5 km south of Rector (PNR), 40.10°N, 79.14°W, 28 August 1966, 2♀, B. Vogel, DMNS ZA.139. *Utah*, Salt Lake County, near mouth of Red Butte Canyon, 6 August 1948, sweeping, 1♀, 2♂, K. Lafferty, AMNH. *Utah*, Utah County, 19 August 1977, on ground, 2♀, J.C. Cokendolpher, MWSU. *Utah*, Utah County, Manti-LaSal National Forest, 16 km west of Monticello, 20 August 1977, 1♀, J.C. Cokendolpher, MWSU. *Virginia*, Giles County, 5 August 1949, Wallace Collection, 2♀, H.K. Wallace, FSCA. *Virginia*, Giles County, Mountain Lake, August 1949, 1♂, H.K. Wallace, FSCA. *Virginia*, County unknown, Poor Man's Mountain, SR 17, 1♂, det. by V. Roth, 1952, FSCA. *Wyoming*, Teton County, woods above lily pond just south of Moran, 43°N, 110°W, 17 August 1950, 2♀, D.C. Lowrie, AMNH.

DISCUSSION

Ayoub et al. (2005) carried out a molecular phylogenetic analysis of various populations of *Agelenopsis* including all the species except *A. actiosa*. In their study, they noted well supported species groups including: *A. aleenae* and *A. spatula*; *A. utahana* and *A. oregonensis*; and a third including *A. potteri*, *A. pennsylvanica*, and *A. emertoni*. Our morphological cladistic analysis supports the existence of these species groups, demonstrating a close relationship between *A. aleenae* and *A. spatula* as well as a relationship between *A. oregonensis* and *A. utahana*, and a well-supported clade including *A. pennsylvanica*, *A. potteri*, and *A. emertoni*. Our analysis, which included *A. actiosa*, placed this species with the *A. pennsylvanica*, *A. potteri*, *A. emertoni* clade: (((*A. pennsylvanica* + *A. potteri*) + *A. actiosa*) + *A. emertoni*). Our analysis suggested that *A. longistyla* is more closely related to the *A. oregonensis* + *A. utahana* clade and we also found that *A. oklahoma* is more distantly related to the clade including *A. oregonensis*, *A. utahana*, and *A. longistyla* than to the other species. Our 50% consensus tree (Fig. 62) showed > 50% bootstrap support for all clades.

The atrium of both female *A. aleenae* and *A. spatula* are very similar, particularly along the monolobed anterior edge (Figs. 34, 35), as are the spatulate embolic tips of the males of these two species (Figs. 2, 14). *Agelenopsis oregonensis* and *A. utahana* show similarities in the internal genitalia, particularly the shape of the spermatheca and the diverticle (Figs. 51, 52). Both *A. actiosa* and *A. pennsylvanica* have similarities in the shape of the embolic tip (Figs. 4, 8). The subtriangular segment of the embolic tip is also seen in *A. emertoni* (Fig. 26). *Agelenopsis actiosa*, *A. pennsylvanica*, and *A. potteri* all have similarly shaped atrial openings (Figs. 30–32).

Agelenopsis aleenae, *A. spatula*, and *A. aperta* inhabit a narrowly defined area within the southwestern United States (Fig. 61D). *Agelenopsis aperta* resides in all of the southwestern states from California to Texas while *A. aleenae* and *A. spatula* occupy a narrower region in Colorado, New Mexico, and Texas. In an agelenid study in the Malpais Lava Beds in central New Mexico, *A. aleenae* and *A. spatula* were not collected together, but in one instance *A. aperta* was found with *A. spatula* (Ayoub et al. 2005). In none of our collecting trips did we ever find *A. aleenae* and *A. spatula* together although there is great overlap in their respective ranges, suggesting that these two morphologically similar species (as well as other species of the genus) may be segregated by habitat, as suggested by Guarisco (2014). Based on their collection records, Ayoub & Riechert (2004) estimate that the range of *A. aperta* is limited to below 2000 meters and that the species is more susceptible to cold than some other agelenid species. Yet the range of *A. aperta* includes all of Colorado and Utah as well as parts of Wyoming, an area covering elevations well above 2000 meters (Fig. 61D), confirming that this species may well be hardier and more adaptable to a variety of habitats than the comparatively smaller species of *A. aleenae* and *A. spatula* with more restricted ranges.

While none of the other *Agelenopsis* species share both morphological and geographical similarities like the group including *A. aleenae* and *A. spatula*, it is noteworthy that the other *Agelenopsis* species with more limited ranges, specifically *Agelenopsis longistyla* (Fig. 61B, circles) and *A. oregonensis* (Fig. 61B, triangles) tend to be small or medium in size (10 mm or less in length) and have shorter maturation periods (from roughly August through September) than larger and more widespread *Agelenopsis* species (Paison 1997). *Agelenopsis longistyla* is located primarily in the southwestern states of Arizona, Colorado, New Mexico, and Texas while the range of *A. oregonensis* is confined to the northwestern portion of North America including northern California, Oregon, and Washington as well as western Canada (Fig. 61B). As with *A. aleenae* and *A. spatula*, these species may be more confined to particular ranges because they may be less adaptive to varying habitats.

Our study provides the first revision of all 13 species in the genus *Agelenopsis*. In addition to *Agelenopsis* monophyly, our cladistic analysis provides support for the species groups proposed by the molecular study of Ayoub et al. (2005). The distinct morphological differentiation of genitalic structures among species in this genus, along with the recognition that *Agelenopsis* species are ground, and most likely not aerial dispersers (Ayoub et al. 2005), suggests that this genus may provide an ideal system to test hypotheses regarding the importance of morphology and habitat segregation in speciation.

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